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A SOCIAL PERCEPTUAL APPROACH TO FREIGHT TRANSPORT MODAL CHOICE

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ABSTRACT

This research develops a conceptual model of freight modal choice in which the basic unit of analysis is the socio-organisational group.

Research into freight modal choice at the level of the firm has tended to disregard the nature of human choice and to assume that modal choice can be explained in terms of technological phenomena or cost relationships. There is also a tendency to equate the modal choice of organisational members with the modal use of firms. The approach adopted in this work is to accept that there are different interest groups within shipper firms and that such groups may not necessarily form a consensus of opinion about freight modal choice. It is assumed that different socio-organisational groups may form different implicit theories about transport systems. Such an approach is called the social perceptual approach.

The conceptual model is converted into an operational model and an empirical investigation is undertaken into the area of modal choice between air freight transport and surface less than full load freight transport from the United Kingdom to Western Europe. In particular, the standpoint of shipping managers (managers responsible for arranging international freight transport in exporting companies) is examined vis-a-vis certain normative approaches such as the through transport concept.

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CHAPTER 1. INTRODUCTION

1.1 Objectives

The first objective of this work is to develop a research approach to freight modal choice, grounded in theory, which takes into account socio-organisational factors often disregarded in studies of freight modal choice, but which at the same time takes into account specific freight flows.

The second objective is to throw light on the practical problem area of the role of the shipping manager (the person responsible for international freight transport in exporting companies) in freight modal choice to W. Europe. This particular area is used as an illustration of the first objective.

1.2 Background and value of research

There is clearly a desire among researchers (eg Meyburg in Hensher and Stopher eds (1979)) to develop behavioural models in the analysis of goods movements. Chapter two will cite several examples of researchers claiming the need to understand the decision making of the shipper. Meyburg assesses the applicability of behavioural modelling to the analysis of goods movements. He states,

'The freight transport sector can be viewed from two major concerns, namely from the planning or regulatory context of social efficiency and from a private efficiency point of view. The former constitutes a somewhat more comprehensive outlook with societal concern and welfare being the over-riding issues, while the latter represents the freight industry's viewpoint which is focused on the provision of service and profit maximisation.

'It was concluded that, in the short run, research efforts should concentrate on those decision elements that determine the physical flow of goods, with shippers, receivers and operators being the prime actors whose behaviour and decisions are to be analysed. It was felt that the effects of decisions made by planners and regulators can only be evaluated after the decisionprocess directly affecting the physical goods-movement process is well understood. As a consequence land-use planning and policy analyses will need increased attention after the characteristics of the physical distribution process have been analysed and understood.'(p625)

Meyburg writes of 'actors whose behaviour and decisions are to be analysed' and later in the article we learn that 'the identifiable actors in the process are the shipper, transport operator (vehicle and terminal operator or forwarder), receiver and government (in a regulatory, control and/or planning function)' (p627). Despite references to 'individual-choice' models the behavioural approach of Meyburg assumes the firm to be the basic unit of analysis. Most models of freight modal choice ignore the well-known fact that modern industrial organisations are often large, complex and possess a number of departmental power bases.

It is unlikely that effective behavioural models will be developed until the appropriate units of behaviour have been identified and there is an understanding of how each relevant unit of behaviour interprets modal choice.

There is a difficulty in identifying the appropriate units of behaviour since there is a tendency, as in the example above, to assume that the 'firm' is the sole unit of behaviour. There are probably two main prevailing orthodoxies in freight modal choice modelling at the level of the firm which make this assumption. First, there are models which assume that modal use is based on relationships between physical aspects of the transport system and physical aspects of the product (this work will call such an approach 'technological positivism' since it makes deterministic assumptions about technological variables). Second, there are models which assume that modal use is based on profit maximisation or some other form of cost optimisation within the shipper firm (this work will call such an approach 'economic positivism' since it makes deterministic assumptions about economic or cost variables).

Some worthwhile studies have been based on the above two assumptions and it is not the intention of this work to contest their research validity. However, there is a tendency among some researchers to adopt prescriptive approaches such as the logistics approach, and assume that they are descriptive approaches. The logistics approach is an integrated approach adopted by business management in some firms which attempts to make overall cost savings by considering the various functions of transport, inventory control, communications, warehousing etc as an integrated system. The logistics approach is a perfectly valid normative management approach. However, it should not be assumed by researchers that what should be is necessarily what is.

The approach adopted in this work is to accept that there are different interest groups within industry and that such groups may not necessarily form a consensus of opinion about freight modal choice. An appropriate level of analysis of such interest groups would appear to be at the level of the task group, since it is assumed that people undertaking similar tasks in different firms are likely to have similar opinions about modal choice. There have been a number of studies of freight modal choice that base their results on the perceptions of organisation members, predominantly transport managers. Such studies are described in this work as adopting a 'perceptual approach'. However, such studies do not appear to see their results explicitly in terms of the perceptions of a particular socio-organisational group, although this is often implied.

The approach adopted in this work develops this approach and assumes that members of social groups within organisations form implicit theories about the transport system. Thus, they do not merely have a set of uncoordinated perceptions but are capable of formulating a 'theory', however loosely structured. As in the academic disciplines, it is possible for more than one theory to coexist and possibly conflict in their interpretation of a particular aspect of the world. It is proposed in this work that, by understanding the different theories of relevant socio-organisational groups, it is possible to achieve greater understanding of the potential for change in freight transport

demand. For example, this work will examine the contrast between the implicit theory of shipping managers and an aspect of the logistics approach called total distribution costing. Since the approach presented here is concerned with perceptions which are explicitly grounded in a socio-organisational context, it is called a social perceptual approach to freight modal choice.

The social perceptual approach is intended as a general approach which may be applied to any area of freight modal choice. However, in this work it is applied to the particular problem area of freight movements between Britain and W. Europe.

This is an important problem area for a number of reasons. According to the National Economic Development Office's (NEDO) Economic Development Committee for International Freight Movement (1977),

'Through transport is a dominating factor in world general cargo movement. Because distribution has had a lowly place in British management esteem and because few transport or shipping managers reach Board level this domination may not be sufficiently recognised. Basic distributive principles are too frequently insulated from the attention and understanding of top management, who as a result are often neither equipped nor encouraged to engage in distribution planning or to assess the relative strategic advantages of alternative systems and services' (p19)

This quotation is one of several given in this thesis which underlines the validity of adopting a social perceptual approach. A theoretical standpoint is presented that 'through transport' (ie an integrated door to door transport system) is necessarily beneficial and that it is supported by 'basic distributive principles'. It is assumed that this theory is supported by one socio-organisational group (transport or shipping managers) and that another socio-organisational group (top management) is unaware of it. The statements of NEDO are apparently unsubstantiated empirically in that reasonably detailed evidence has not been published. It would appear sensible to adopt an approach which attempts to identify significant socio-organisational groups and to understand the implicit 'agreed theory' of such groups, if one is to exhort companies to adopt the prescriptive through transport approach.

The reason for the concern of NEDO about distribution efficiency is that poor delivery performance is often cited as one of the basic reasons behind Britain's indifferent export record. Between 1962 and 1977 Britain's share of world trade in manufactured goods fell from 15.5% to 9.3% whereas those of West Germany and France remained constant at about 20% and 9% respectively (Barclays Bank International 1979). There is evidence that, unlike Japan and West Germany, there are few companies in this country in which export sales predominate. According to Philpot (1975) over four-fifths of companies in a survey of 270 exporting small and medium-sized companies returned 1973 export sales figures which accounted for under 40% of the company's total turnover. Further evidence of the relative unimportance of exports is provided by NEDO (1977a) who state that British firms tend to push

more resources into exports when they experience a recession, switching them back to the home market when home demand recovers. It is possible that this phenomenon accounts for the favourable trade balances at the time of writing during the trade recession of late 1980.

A number of studies have provided evidence of the importance of delivery performance. A NEDO (1977a) report states that non-price factors appear to be major determinants for purchasing a particular country's exports, particularly in the markets for more sophisticated products such as machine tools, domestic electrical and electric motor products. Steuer et al (1966) found that the waiting time (the delay between the placing of an order and the shipping of a product) was a highly significant variable and that a one-month rise in the United Kingdom waiting time would reduce export orders of machine tools by about 10%. Bispham (1970) suggested that in the British engineering industry relative delivery dates typically accounted for three times as much of the typical variation in export orders as did relative prices.

A number of studies have indicated that the United Kingdom has a poor relative delivery performance. In a study by Industrial Market Reseach (1977) delivery failure was placed second only to price disadvantage among the problems of exporting abroad, and second only to communications as a general problem of exporting. In a study by the Council of British Chambers of Commerce in Continental Europe (1979) companies selling British-made products were asked to rank a list of factors that could be limiting their export sales. Respondents in the markets where there were no tariff barriers (France, W.Germany, Italy and Swit zerland) placed delivery first, and those in countries with tariff barriers (Greece and Spain) placed delivery second after customs tariffs or quotas, or suppliers' prices. In areport prepared for Barclays Bank International (1979) it was found that small British exporting companies offered noticeably longer delivery dates than their French or West German counterparts, although the difference does not apply to larger companies. The report found that a greater proportion of British companies in general considered that their competitors' delivery dates were better than their own, unlike French or West German companies.

Transport is, of course, only a stage in a delivery process which begins with the customer placing the order. It could be assumed that the longer the time taken for the order preparation stage, the less significant the transport time becomes. A transport time of five days may be barely noticeable as a coda to an order preparation time of fifty days. However, it is not only necessary to consider goods as entering the transport stage from a wider set of activities, but also to look at the status of goods in terms of delivery times. It may not be easy to identify which consignments are considered to be late or overdue by exporters. In a somewhat dated study by NEDO (1968) more than two-thirds of the exporters to Europe interviewed said that they did not give their consignees a definite date by which a consignment would be despatched, shipped or delivered. Where dates were given, the same study found that only 50% of goods were despatched by the promised date of despatch, 23% left the exporters' premises more than 10 days late, and 8% left the exporters' premises more than a month late. In a more recent survey by New (1976) it was found that on a 90% 'on time performance'

criterion only one in five factories achieved satisfactory performance, and one in four factories delivered more orders late than on time. The New survey refers to orders for both home and export markets.

Although transport may consist of only a small part of the total lead or delivery time, it is likely to be important if a high proportion of consignments are late since it is the final stage in a process where time savings may be made, for example, by changing from surface transport to air transport in international distribution. A survey by the Civil Aviation Authority (1977) found that 80% of British exporters use air freight, although fewer than 50% use it for more than 5% of their tonnage. The same survey found that the characteristic given most frequently as a reason for using air freight was the 'need for urgent delivery'. This applied even to consignments covering the fairly short distances from Britain to W. Europe where 60-65% of air freight consignments were required to be sent by a premium service,(ie a service with a high probability of the goods leaving on the next flight) rather than a slower air service.

As an empirical area of study this thesis examines the relative use of air transport and less than full load surface transport between Britain and W. Europe. This is a particularly interesting area of study since, on the face of it, there is little purpose in using air freight except in exceptional circumstances owing to the supposedly low time savings, according to the claims of surface transport operators.

However, air freight is reasonably widely used to W. Europe according to the annual statistics of 'Trade and Industry' (now called British Business') which is the weekly publication of the Departments of Trade and Industry. British exports by air as a percentage of all exports were 14% to W. Germany and 13% to France compared with 20% worldwide by value. Although exports to W. European destinations have declined since 1970 relative to exports by other modes of transport and relative to worldwide air exports, nevertheless, in 1977 29% of all United Kingdom air exports by value and 23% by weight were sent to E.E.C destinations. A particular area of interest examined in this work is the relative lack of success of express surface services, which claim to be as fast as or faster than air freight services, to penetrate the air freight market.

The empirical work conducted in this thesis examines the above modal choice problem from the standpoint (the social perception) of the export shipping manager. NEDO(1977) is critical of the quality of British management stating that, 'all the evidence points to a markedly more distribution-conscious industrial management in France, Germany and especially Holland'(p19). Barclays Bank International (1979) state that many of Britain's problems are associated with the quality of middle management, a group to which shipping managers tend to belong according to Gray and Davies (1981). However, there appears to have been little detailed published research into specific features of the role of the shipping manager directly related to freight transport movements. This is possibly because, as indicated by NEDO (1977), senior management is largely unaware of the importance of freight transport. For example, in a survey of nearly 400 shipping managers, Davies and Gray (1980)

found that 43% of the respondents to the survey spend over £100,000 annually on export freight. In spite of such large amounts about two-thirds of respondents do not work within a defined budget, indicating either a lack of awareness or of interest in freight transport on the part of senior management.

By examining a specific area in detail, it is possible that this work may assist in understanding the relationship between socio-organisational groups and freight modal choice on a wider plain.

1.3 Chapter development

Chapters two to five are concerned with theory and the development of a conceptual model.

Chapter two introduces the research area of freight modal choice and distinguishes between aggregate and disaggregate studies. Aggregate studies are generally concerned with freight transport modal split at the regional level, and disaggregate studies are generally concerned with modal choice at the level of the firm. Chapter two outlines the problems of aggregation and homogeneity in freight transport research and considers the problems of selecting an appropriate unit of analysis at the disaggregate level. In particular , it describes the fallacy in some studies which assume that significant variables at the aggregate level are necessarily capable of explaining modal choice at the disaggregate or behavioural level. Three basic approaches are identified at the disaggregate level. •Two approaches are positivistic in the sense that human action is presumed to be determined by relationships between costs (the economic positivist approach) and between technological phenomena (the technological positivist approach). Rationality is assumed to be based on the maximisation of utility in respect of the cost or technological variables. • A third approach assumes that modal choice is based on the subjective interpretation of variables known to the shipper and is called the perceptual approach.

Chapter three introduces organisational buyer behaviour as an area which may contribute to an understanding of freight modal choice. A review of organisational buyer behaviour studies concludes that such studies are concerned primarily with the purchasing activity as a decision making process and tend to be organisation-centred. Whereas studies of freight modal choice tend to underemphasise the nature of buyers, studies of organisational buyer behaviour tend to underemphasise the nature of the product or the service. Nevertheless, a number of studies of organisational buyer behaviour related to freight transport are described as providing valuable insights into the nature of shipper decision making.

Chapter four pursues the theoretical development by taking up the concept of rationality introduced in chapter two. Organisation theory proposes that different organisational decision makers adopt 'subjective rationalities' by which they form limited models of reality suitable for their particular organisational tasks. Personal construct theory adopts a similar perspective, although at the social psychological level rather than at the sociological level of organisation theory. According to personal construct theory every individual is a 'scientist' formulating 'theories' about his world in a subjectively rational manner. An operational technique (the repertory grid technique) associated with

personal construct theory is introduced. The relevance of the two theoretical approaches to freight modal choice is described.

Chapter five develops a conceptual model based on the social perceptual approach to freight modal choice. This approach is developed from the findings of the preceding chap ters and assumes that members of social groups within organisations form implicit theories about the technology of the transport system. Modal choice is assumed to be a conclusion arrived at as a result of a 'theoretical' standpoint on the part of a particular socio-organisational group. Socio-organisational groups are identified according to their tasks at work (eg shipping managers) and different groups have different relative power in determining the actual use of freight transport. Modal use is likely to depend on compromise between the conflicting theories of different socio-organisational groups.

Chapters six to eight are concerned with the development of the operational model.

Chapter six describes the topic area of international freight transport from which the empirical work associated with this thesis is drawn. It presents international freight transport as a functional system, and international freight transport in the context of marketing channels. The chapter then focuses on specific areas associated with the empirical work of this thesis. The role of the shipping manager is described in order to identify the socio-organisational group whose modal choice is considered in this work. The area of international freight movement about which the group of shipping managers will make its modal choice is described. This is the modal choice between air freight transport and less than full load surface freight transport from the United Kingdom to W. Europe.

Chapter seven develops the operational model. It describes how the implicit theory of the socio-organisational group of shipping managers is developed through examining the relationships between cognitive structures of individual shipping managers, their measurement of technological phenomena in the transport system and the socio-organisational influences on them. Each of the variables is described in detail. The chapter describes the development of the elicitation technique to obtain details about modes and services and the statements that shipping managers make about them. The chapter describes the repertory grid procedure adopted and the form of the two questionnaires associated with the research.

Chapter eight describes the survey sample and the framework of analysis. The source of the sample population, the sample size and the representativeness of the sample are examined. A brief summary of the sequence of analysis is given.

Chapters nine to fourteen are concerned with the analysis of the results of the empirical survey.

Chapter nine analyses technological variables related to properties of the product and is concerned primarily with technological data as an indication of modal use. It establishes that the group of products in the survey are basically surface-orientated and a number of measures indicate that the use of air freight increases with the value-weight ratio, even at the disaggregate level.

Chapter ten analyses technological variables related to properties of the transport system, and in particular, variables associated with transit times. It establishes a significant difference between both the absolute perceived door to door transit times (air is perceived as being faster than less than full load surface transport) and the variability in transit times (air is perceived as being less variable). The perceived difference between the transit times for the two modes is shown to increase with distance although this does not appear to influence their relative use. The frequency of departure for air transport is considered much higher than that for surface transport, although the transit time for surface transport does not appear to be seen as related to frequency of departure.

Chapter eleven analyses the socio-organisational factors which are assumed to influence the implicit theories of shipping managers. It examines relationships in the two channels of trading and transport. In the trading channel it appears that consignees who are retailers and wholesalers are more concerned with controlling the international transport than consignees who are manufacturers or divisions of the exporters' own companies. The greater propensity of the latter class of consignee to purchase goods on c.i.f or delivered domicile terms of sale is associated with the greater use of surface less than full load transport rather than air transport. Continental buyers appear more inclined to use air transport when they control the terms of sale than are British exporters. In the transport channel intermediary freight forwarders are used much more for air transport than for surface less than full load transport. In the latter case exporters tend to deal with carriers much more frequently. In general, exporters tend to adopt a much more differentiated approach to less than full load surface transport than to air transport, changing their transport operators more frequen tly, using different operators for each destination, and using a greater number of operators to each destination in the case of surface transport.

Chapter twelve examines the cognitive structures of survey respondents, or the patterns which emerge from each repertory grid. It was found that in a number of respondents' grids two distinct patterns emerge - one of which is based on the comparison of the surface and air modes and one of which is based on the comparison of most and least preferred transport services, irrespective of mode. The pattern based on intermodal comparison tends to be associated with urgency and the nature of the contact with the transport world in terms of organisational type, whereas the pattern based on preferred transport services irrespective of mode (intramodal comparison) is associated with depot delays, monitoring and control, and a range of other factors. The general pattern that emerges is that intramodal comparisons tend to be associated with attributes of the technology of the transport system, whereas intermodal comparisons tend to be associated more with aspects of the shipper or product. It was found that air transport is generally perceived as 'better' than surface less than full load transport in that respondents make a greater differentiation between surface transport services,

and the least preferred surface services tend to be isolated from all other services in shipping managers' cognitive structures.

Chapter thirteen consolidates the analyses of chapters nine to twelve, and develops the implicit theory of the group of shipping managers. The conclusion is that surface less than full load transport is perceived as a series of differentiated route-specific normal channels whereas air transport is perceived as a terminal-specific single undifferentiated urgent channel for W. Europe. The two modes tend not to be compared in terms of the attributes of a transport system since they are not perceived as belonging to the same category system. The implications of the implicit theory are considered in the context of three practical problem areas. These are the use of express surface vans in place of air transport to W. Europe; the use of air freight in place of surface transport in general in the context of total distribution costing; and the institution of the through transport concept advocated by NEDO (1977). Each topic is considered from the standpoint of the shipping manager and his implicit theory of the transport system vis-a-vis other possibly countervailing theories.

Chapter fourteen examines the scope for further research.

CHAPTER 2. FREIGHT TRANSPORT MODAL CHOICE

2.1 Introduction

This chapter will show that the term 'choice' in freight transport modal choice is subject to a number of interpretations. Many of the studies in the area are not concerned with 'choice' in the sense of decision making or modal selection at the level of the firm, the group within the firm, or the individual person. This results from the transport planning framework within which modal choice models have mainly developed. Transport planning is predominantly concerned with freight flows at a level of aggregation greater than that of the individual shipper, and in particular with total tonnages.

However, in recent years there has been a movement to disaggregate to the supposed decision making unit in an attempt to gain greater understanding of the motivations of users of freight transport. For example, studies have taken into account such factors as the profit-making objectives of the firm, or behavioural or perceptual factors presumed to influence freight modal choice.

The objective of this chapter is to assess different research approaches at the disaggregate level. Many of the models in modal choice studies described in this chapter were used to examine specific situations and the researchers drew conclusions about the main determinants of modal choice. The chapter examines how such conclusions may be related to the structure of the models, but does not attempt to produce a generalisable conclusion about the major determinants of freight modal choice. This would be a difficult activity since, not only do research approaches differ widely, but also the situation (geographical, legal-political etc) in which the transport activity takes place is seldom the same for any two studies. Nevertheless, the conclusions of individual studies are stated and will be used as source material where appropriate in later chapters.

2.2 Research approaches to freight modal choice

The purpose of this section is to examine classificatory systems used when reviewing freight modal choice literature. To obtain an understanding of how modal choice studies may be classified, an initial examination is made of a number of other reviews of freight modal choice, in which the authors have developed their own classifications.

Bayliss (1972) has reviewed the theory and application of modal split models for the European Conference of Ministers of Transport. (The implications of the use of the terms modal split or modal choice are considered at the end of this section). He suggests that the two basic reasons for carrying out modal split analysis are, first, for market research on behalf of transport operators to determine the importance of various factors when selecting transport modes and, second, as part of a forecasting exercise to estimate the flow of future traffic by planners as part of an investment appraisal.

For Bayliss the two reasons are fundamentally different. In the market research approach there is a desire to establish the determinants of demand in themselves, and the total quantities of traffic carried by any mode need not be important. On the other hand, the freight forecasting approach need not be concerned with the underlying reasons

for using a particular mode, since it aims merely to establish quantifiable traffic flows. Furthermore, the forecasting approach to modal split is often merely part of the wider activity of measuring traffic generation, attraction and distribution which may constitute the entire forecasting exercise.

After establishing the two main reasons for modal split analysis Bayliss outlines four research approaches which, taking into account the emphasis of the work presented here, may be condensed into three approaches, which are

a) market research approach

b) consignment approach

c) aggregate flow approach.

The aggregate flow approach is a combination of the total traffic flow approach and the multi-regional flow approach described by Bayliss. In fact, in another work Bayliss (1971) himself divides modal split research into the three broad categories mentioned here.

He adopts a more limited interpretation of the term 'market research' than might normally be accepted. He states that 'this approach to modal split may be aimed either at the use of a particular mode or at obtaining information on the shipper's general transport requirements' (Bayliss 1972 p 22). He is critical of studies which have adopted this approach, not only for being too general (ie not referring to specific commodities or activities), but also for not being genuine modal split analyses, since shippers are not asked to state preference for one mode compared with another.

The aggregate flow approach establishes relationships between nationally or regionally aggregated data ranging from fully aggregated analyses (eg the relationship between gross national product and total ton-mileage) to models disaggregated to specific commodities by mode on particular network links. The larger scale models generally take no account of the behaviour of shippers in the sense that they do not use a unit of analysis which can be directly attributable to individual shippers. Such units might be consignments or decision makers.

The final approach, the consignment approach, was applied by Bayliss and Edwards (1970) in a study for the Ministry of Transport and uses as its basis the individual consignments shipped by firms. Bayliss claims that the advantage of this approach is that it observes actual behaviour in terms of the flow of consignments, rather than being dependant on general attitudes (as in the case of market research studies) or ignoring behaviour (as in the case of aggregate flow studies).

Another survey of freight modal choice modelling was undertaken by the Transportation Research Board of the National Research Council, Washington DC (1977). The purpose of this study was to describe the freight modal choice models which are applicable in state-wide transport systems and to identify the specific data requirements. Freight modal choice analysis is seen as an important tool in the enlarged role of state involvement in freight transport in the USA. The Transportation Research Board suggests that states must develop the means of analysis required to take a more active role in freight planning owing to such factors as the bankruptcy of railway companies, the development of state subsidy programmes and the likelihood of increasing regulation (these last two aspects are perhaps no longer valid in the economic climate at the time

of writing in 1980).

Their classification was somewhat unusual being the mixture of theoretical approaches and multivariate mathematical techniques listed below (p 70 of their report):

a) macro-economic approach

b) inventory theoretic (i. shipper preference; ii. micro-economic)

c) regression analysis

d) abstract mode (using regression analysis)

e) linear programming

f) discriminant analysis

g) logit analysis

h) probit analysis

The general conclusions of the report are that 'all freight mode split models have attempted to replicate the decision-making process of shippers in deciding among modes' (p 82), that there is no consensus about the most suitable method of analysis, and that none of the methods have proved particularly successful. The Transportation Research Board considers that the types of unresolved questions needed to be asked in view of the lack of consensus include those about

a) degree of aggregation

b) the relevant variables to be used

c) the level of approach (eg at the level of the of the individual firm or all firms within a region)

d) the degree of homogeneity of commodities.

The report proposes that state planners should adopt a three stage approach which is

a) prepare 'total demand estimates by individual mode using historical trend extrapolation techniques and linear probability functions' (p 84)

b) prepare 'interregional demand estimates by aggregate commodity groupings by individual mode using mathematically based freight modal split modelling techniques, such as the abstract mode or commodity approach' (p 84)

c) prepare 'intercounty, commodity flow estimates by individual mode using disaggregate behavioural mode choice models (logit, probit and discriminant analysis functions)' (p 84).

Roberts (1971) reviews modal choice models from the standpoint of the types of institution interested in freight traffic demand. He considers that there are three types of institution, each with a different viewpoint - the government, the carrier and the shipper. The government is interested in large scale models which look at entire systems and which describe the routing, volume and mode of freight movements. The objective served by models intended for government is usually to assist in investment planning or regulatory policy. A carrier's interest in freight traffic models is from a marketing standpoint, since the carrier wishes to know the type of service he should offer and the manner in which he should present it. The third type of institution, the shipper,

is concerned with specific movements and models should suggest a preferred course of action or the implications of alternative courses of action for a specific movement.

Roberts claims that ultimately only the shipper makes the modal choice decision and that, therefore, 'we should take the shipper's point of view regardless for whom the model is being built. Ultimately the carrier is concerned with those shippers who are his potential customers and the government's concern is with the spectrum of all shippers. Thus, the shipper assumes a central role in the analysis' (p 141). Roberts goes on to describe a logistics management model (described later in this chapter in section 2.5.1) for which he claims a number of uses. First, it can be used by a shipper to study specific order strategies for single-item inventories, or to understand costs and explore the sensitivity of the shipper's inventory policy on his most important items. However, Roberts suggests that this model may also be extended to 'its logical conclusion' (p 146) and that government could undertake full scale analysis of modal choice policy by 'sorting the entire spectrum of shipments into categories spanning different demand levels, length of haul and nature of commodity' (p 146). Instead of presenting micro modelling (ie at the level of the firm) and macro modelling (ie at the level of the region) as two separate approaches, Roberts believes that macro models must develop from micro models. Until the nature of choice for a particular commodity on a particular mode between two specific points is understood, it will be difficult to produce satisfactory macro models.

2.3 Aggregation and homogeneity

Two important concepts which emerge from these reviews are those of 'aggregation' and 'homogeneity'. De Neufville and Stafford (1974) state that 'aggregation of the data [in models hypothesising about a system] is achieved by taking the average sets of detailed observations, defined over a certain range in time and space, and using these averages as the single observations for that range'(p 274). They describe a number of fallacies which may arise during the process of aggregation. These are called 'cross-level fallacies' which arise when it is assumed that what is valid at one level of aggregation applies for another level. They identify seven such cross-level fallacies of which the most frequent and most important is the 'ecological fallacy'. This is caused by falsely inferring that what is true for 'ecologies' or groups is true for individuals and it is likely to occur when data are averaged over groups.

There are obvious difficulties in determining the appropriate level of aggregation of data for any particular research, evident from the reviews of freight modal choice studies described in section 2.2. In the context of this work, the ecological fallacy is particularly relevant since it indicates that aggregate significant correlations do not necessarily reflect the behaviour of the basic unit of analysis, that is, at the level of the behavioural unit. A modal split at the regional level may not of necessity provide a meaningful interpretation of the modal choice at the level of the firm, and nor need the reverse be valid. The logical fallacy in this case would be the converse of the ecological fallacy which is the individualist fallacy, assuming that what is true for individuals must also be true for groups. This point is recognised in the review by Bayliss where he identifies two basic and fundamentally different reasons for conducting modal split analysis. The Transportation Research Board acknowledges an aggregation problem but is perhaps too inclined to relate all modal choice models to what it sees as the

decision making process of shippers. Similarly, Roberts sees a logical link between macro models (at the regional level) and micro models (at the level of the firm), claiming that variations of a single approach are suitable for studying both specific order (ie consignment) strategies for single item inventories for a single shipper and an approach at the regional level.

The potential for cross-level fallacies in freight modal choice aggregation is strengthened by the existence of at least three paths of aggregation. These are

a) aggregation of decision making or behavioural units (eg the firm)

b) aggregation of movement units (eg the consignment or order)

c) aggregation of product units (eg by weight or volume)

Obviously, the appropriate path of aggregation (or, often, disaggregation) will depend to a large extent on the purpose of the study.

Rather than assume a continuity between the different levels of aggregation, it might prove useful to observe a fundamental difference between 'modal split' and 'modal choice'. It is noticeable that these two terms are substitutable in the reviews described in section 2.2, if the works are taken as a whole. For example, Bayliss uses the term 'modal split' throughout, whereas the two terms appear interchangeable in the Transportation Research Board report. The interchangeability of the two terms may reflect a positivistic assumption in many models where choice is not perceived as a human decision process but rather as an outcome determined by technology or by economic value. This point is discussed in detail in section 2.4. 'Modal split' should possibly be reserved for the 'splitting' activity undertaken by researchers of interregional freight flows. In such an approach no attempt is made, or necessarily even required, to model the decision making or judgemental process used in the selection of freight transport modes by shippers. On the other hand, modal choice may be reserved for those situations where the researcher is attempting to describe such decision making or judgemental processes. This work is, of course, interested in the latter type of study.

The concept of homogeneity is closely associated with that of aggregation in that it is assumed that the homogeneity of some characteristic will lead to uniformity in choice of mode. Bayliss (1972) claims that 'the essense of aggregation is the aggregation of homogeneous units' (p 41) and that 'the problem, therefore, is to reach a working level of aggregation, without involving the aggregation of too heterogeneous units' (p 41). The Transportation Research Board claims that 'the critical element in any freight modal split analysis is elimination of heterogeneity within aggregate data sets'(p 83). In common with other researchers the Transportation Research Board restricts homogeneity to commodity characteristics, writing of 'homogeneous commodity groupings for aggregate data testing' (p 83).

2.4 Deriving a taxonomy for a literature review of freight modal choice models

Many of the type of model described in the three reviews of freight modal choice presented in section 2.2 adopt positivistic explanations

which may be placed under two headings. First, it is often assumed that physical attributes or technology determine the use of transport at the level of the firm and, second, that economic value (eg marginal revenue) determines the use of transport.

Technological positivism refers to the view that human behaviour is the outcome of technology (see for example Silverman (1970)). The term 'technology' has been given a variety of meanings by different writers. For example, Schon (1967) defines it as a process or technique which extends human capability, whereas Galbraith (1972) sees it as a social process, as the application of organised knowledge to practical tasks. In the current work technology is assumed to consist of both hardware (machinery etc) and software (processes, routines) but does not include the human social activity. Therefore, it follows the definition of Schon rather than that of Galbraith. Positivism is a concept developed in the nineteenth century by Comte (see Passmore 1968) and others which describes knowledge as consisting in the description of the relationships between phenomena (in this case technological phenomena).

In the context of freight modal choice, identification of the nature of technological positivism may be sought through the concept of homogeneity. The movement of freight is perceived as a process similar to a production process where homogeneity is required of the product being processed. This point is pursued in section 2.5.2.

However, there is an indication by Bayliss (1972) that homogeneity could easily be wrongly attributed, since he writes, 'though the data can be apparently homogeneous, especially as regards purely physical aspects, differences attributable to other causes (even irrational ones) are encountered in practice. There ceases to be any homogeneity from the user's standpoint, either because of the many different possible applications of an apparently homogeneous product (eg the various applications of coal) or because of the user's preference for a particular mode ..... because of his disappointing experience with it in the past '(p 77). Bayliss is suggesting that the modal choice may not necessarily be determined by technological attributes and that the significant unit of analysis might be the person or the firm rather than a physical unit or process. He implies that users might subjectively define the situation and behave accordingly, although his use of the term 'irrational' suggests that he perceives it as 'deviant' behaviour. Thus, modal choice may be explained in terms of shippers' perceptions.

Silverman (1970) has described the two approaches to organisational activity (assuming the shipper of freight transport is an organisation) presented here as contrasting approaches. Technological positivism is contrasted with a subjective or perceptual approach where the influence of technology is mitigated by 'experiences within the larger society [which] impinge upon the ordering of wants and expectations and upon the meaning which people attach to different aspects of an organisation's structure' (p 102). There are a number of theories which support this approach to areas of social activity and they are discussed in detail in chapter 4. The approach assumes that there may be more than one reasonable interpretation of a situation, or, in other words, more than one rationality. Thus, it is possible to speak of 'subjective rationalities' without implying that they are inferior versions of a known 'objective rationality'. This approach is adopted, for example, in one of the two major levels of explanation in industrial sociology described by Parker et al (1977). One level is the macro-level of concern with the institutional

structure, sometimes referred to as a systems or a structural-functionalist approach, and the other level of explanation is the micro-level which examines the nature of meaning in human action (sometimes called the human action approach) which focuses on subjective rationalities, and is therefore a subjectivistic approach.

The two contrasting approaches may be called

a) the technological positivist approach

b) the perceptual approach.

However, it is possible to identify a further important strand running through the reviews of freight modal choice models in section 2.2. The neo-classical microeconomic approach understands choice in the context of firms in terms of the economic theory of the firm, in which a unitary decision making unit (the shipper of freight transport) attempts to achieve short-term profit maximisation. Since the purchase of freight transport involves an economic transaction, usually between firms, it is not suprising that an economic model is widely adopted to explain modal choice. For example, it will be claimed later (section 2.5.1) that the rationale behind the logistics approach and the largely similar inventory theoretic approach is derived from the neo-classical economic theory of the firm. Of course, it is possible to adopt economistic assumptions about the technological positivist and perceptual approaches and to see them as surrogates for an economic approach where the physical or perceptual variables are proxies for money values. Thus, it is possible to add a third classification to the technological positivist and perceptual approaches, and it may be called

c) the economic positivist approach.

2.5 Review of individual modal choice studies

It has been suggested that it is possible to classify modal choice studies under the three broad headings of

a) economic positivist approach

b) technological positivist approach

c) perceptual approach.

This section develops the discussion of the previous section concerning the three approaches and reviews freight transport modal choice studies by allocating them to one of the three approaches, suggested by the particular emphasis of the study. Of course, many such studies combine elements of more than one of the three approaches. However, it is possible to identify a particular emphasis and it will determine under which category the study is placed, an explanation being provided where the categorisation is not obvious. After reviewing the studies, the points of contact between the three approaches are examined.

2.5.1 Economic positivist approach

This approach is based on the economic theory of the firm; that is, the part of microeconomics concerned with the firm in terms of input and output related to price and profit. The theory assumes that 'the firm maximises profits with full information and complete certainty, with no problems of an organisational character' (Bannock et al 1972, p166). In its

traditional form the theory may seem somewhat unrealistic since it does not take into account many of the characteristics of modern firms, for example, the separation of ownership from management, the organisational complexity of many modern, large business organisations, and the imperfect knowledge of the environment within which firms operate (see, for example, Galbraith (1972)). There have been a number of attempts to derive a modern theory of the firm (eg Baumol described in Bannock et al (1972)), but such theories are inclined not to accommodate the organisational complexities of modern firms.

An example of the neo-classical economic approach to freight modal choice is that of Allen (1977) who describes individual shipper choice in terms of the 'rational firm'. According to Allen modal (and market) choice is determined by maximising marginal revenue by selecting the most suitable combination of mode and market according to the following equation.

$$\hat{P} = (P_k - T^{Kj}(Q, \alpha^{Kj}) - QT_Q^{Kj}(Q, \alpha^{Kj}) e^{-i\alpha^{Kj}}$$

$\hat{P}$	marginal revenue
P	market price for the firm's product at K
$T(Q,\alpha)$	transport charge per unit of product (a function of quantity shipped and time in transit)
Q	manufacturer's cost function
α	days in transit
i	interest rate per day (opportunity cost of funds)
$e^{-i\alpha}$	since net revenue is received only after α days, it is multiplied by $e^{-i\alpha}$ to determine its present value
k	market
j	mode

The abstract mode model developed by Baumol and others in the Mathematica team (1967) and also described by Baumol and Vinod (1970) is in the micro-economic tradition and may be seen as an application of a more general theory described by Lancaster (1966a and 1966b). This discussion is restricted to the abstract mode model where it attempts to describe the individual shipper. Examples of the model have been applied to regional flows, a subject beyond the considerations of this section.

According to Lancaster, traditional economic demand theory has difficulty in accommodating new goods. Each consumer has an individual preference map so that, when offered a choice between two collections of goods, he will either prefer one collection to the other, or will be indifferent between the two collections. If a new <u>good</u> is introduced to a consumer it is necessary to discard that consumer's preference map and to produce an entirely new one, thereby losing all the information concerning preferences for the original set of goods.

Lancaster considers that consumers are interested in combinations of characteristics or attributes of goods rather than merely in the goods in themselves. As an illustration, a new car model is not the same as an old one and, therefore, must be treated as a new good in traditional economic theory. However, according to Lancaster a new car model possesses largely the same characteristics as an older model and these are merely combined in a slightly different way.

Baumol and others have adopted the same approach in the concept of the abstract mode and of the abstract commodity transported by it. Thus, an abstract mode will describe a carrier not in terms of rail, air etc but in terms of a vector of values. The values are the attributes which the mode offers the shipper. As a result the mode is defined only in terms of attributes known to the shipper, so that, for example, the type of fuel is unlikely to be an attribute whereas the transit time is. Thus, a slower train service is a different mode from a more rapid one. Baumol and Vinod consider that their approach is within the microeconomic theory of the firm since it 'utilises an approach based on cost minimisation and the equation of marginal cost with marginal revenue productivity as an equilibrium condition which provides the basis for a demand equation whose parameter values can be estimated statistically' (p 417).

A number of specifications of the abstract mode approach have been developed, a simple version of which is given in Baumol and Vinod (p 417). This version is derived from 'inventory theory' envisaging freight in transit as a moving inventory analogous to the processing of goods through a factory.

$$C = rT + utT + a/s + wsT/2$$

where

C expected total annual variable cost of handling

T total amount transported per year (quantity demanded annually)

r shipping cost per unit of commodity (eg tons) (including freight rate, insurance etc)

t average time required to complete a shipment in years

s average time between shipments in years

u carrying cost in transit per unit per year (interest plus deterioration plus pilferage rate)

This equation tells us that the expected total annual variable cost of handling a given quantity of goods is equal to the sum of the direct shipping cost, the in transit carrying cost, the ordering cost and the recipient's inventory carrying cost. The abstract mode is defined in terms of three characterising elements which are, r (the shipping cost), u (the carrying cost) and t (the transit time). a, w and T are exogenously given parameters. This simple version of the model has been extended by the authors elsewhere to take into account such other elements as uncertainty in demand forecasts and delivery time and their effect on the level of safety stock.

Beuthe (1968) in a study of freight modal choice applied to the transport of corn in Illinois developed a modal choice forecasting model at the level of the firm. On the basis that the firm's production cost function will determine only the output it will ship, and therefore need not enter modal choice considerations, Beuthe argues that (under perfect competition) the choice of mode depends on the price of the product, the transport time, the interest rate and the money cost of transport.

Beuthe states that, assuming two modes, one faster than the other where the faster mode is assumed instantaneous (ie zero transit time), the profit realised by each mode is

$$w_1 = PZ - Z^n - gZ$$

$$w_2 = PZ - (1 + i)^a Z^n$$

where

w_1 and w_2 are profit realised by the faster and slower modes respectively

P price of the product in the market

Z output per day ($n > 1$)

g unit cost by fast mode

i interest rate per day and $(1 + i)^a Z^n$ is interest charge on money tied up in production costs during transit

The difference in profit between the two modes ($Xij = w_2 - w_1$) is then derived. If Xij is positive the firm will ship by the faster mode, if negative by the slower mode.

Beuthe develops this basic model, dropping the assumption of an instantaneous faster mode and introducing more modes. He considers that the choice problem may also be used among different carriers of a unique mode to one market, or among several routes and modes to one market, or for all combinations to various markets. He also develops a stochastic model which, in addition to the above characteristics, takes into account what he terms 'additional costs' which vary with the transport mode (cost of loading equipment, uncertainty and other qualitative costs). However, he stresses that such costs (Eij) are particular to each shipper and depend on his location and scale of operations and, furthermore, cannot be observed by the economist. Beuthe claims to overcome this problem by assuming the Eij is a random variable distributed indpendently of the Xij. He then adopts a 'discrimination' approach where an individual shipper will select only one mode and no other. If the Xijs are not accurate predictors of modal choice then the magnitude or variance of the Eijs are significant. In his empirical analysis of corn transport Beuthe found that his model was fairly satisfactory and that shippers tend to select one transport mode to the exclusion of all others.

In recent years a prescriptive approach to the activity of industrial companies has been developed which is often called 'business logistics'. Business logistics has been defined as 'the process of managing all activities required to strategically move raw materials, parts and finished inventory from vendors, between enterprise facilities, and to customers (Bowersox 1974). The essence of the logistics approach is 'an integrated approach where cost savings are identified by considering the total costs of the system. This approach already implies the need

for overall management since the decisions about the different elements of the logistics system (transportation, inventories, facilities, utilisation, communications) are traditionally made within different functions or departments' (Van Buytenen 1976). It is evident that this practical and normative approach has underlying concepts in common with the economic theory of the firm. These are an assumption (in the case of economic theory) or a prescription (in the case of the logistics approach) of unitary control within the company aimed at maximising or optimising profit through centralised control, particularly control of costs.

Some freight modal choice models have adopted a logistics approach which takes into account a wide range of specified costs incurred by the firm when making transport modal choice. One such study is that by Roberts (1971) mentioned in section 2.2. In the model proposed by Roberts a single objective function is derived which attempts to minimise the costs associated with the logistics function. These costs are

a) order cost

b) transport cost

c) storage cost (warehousing, stocktaking etc)

d) capital carrying costs (the interest on capital tied up in inventory)

e) stockout costs (cost of being out of stock)

The logistics cost per unit is derived from the sum of the above costs and is used to derive the preferred choice of three variables: the quantity to be ordered, the level of stock at the time of re-order, and the choice of mode. It will be noticed that this approach has much in common with the inventory theoretic approach adopted by Baumol and Vinod (1970).

2.5.2 Technological positivist approach

The essence of the economic positivist approach is that the decision making unit, assumed to be the firm, attempts to maximise short-term revenue or minimise short-term costs. The essence of the technological positivist approach is that modal choice is explained in terms of the use of technological processes. Within the constraints of technological positivism, variables are selected for empirical reasons, mainly as a result of previous applied research. The review of modal choice modelling by the Transportation Research Board (1977) is to a large extent a review of this type of approach, suggesting that models which employ such techniques as discriminant analysis, logit analysis and probit analysis are all attempts to 'replicate the decision making process of shippers in deciding among modes' (p 82). It describes how researchers have 'experimented with a wide range of mathematical forms in their desire to discover a rational, explainable basis for modal choice modelling' (p 82), that 'the inconclusiveness of the results obtained is usually attributed to problem of data availability' (p 82). The report has faith not only in the types of model used but also in the variables being considered, since it assumes that explanatory powers would improve substantially if available data were better. The explanation offered by all such models is positivistic in the sense that human choice (ie the selection of a transport mode) is presumed to be explained by relationships between technological phenomena.

According to the Transportation Research Board (p 83) the most frequently used independent variables are

a) weight of shipment

b) distance shipped

c) value per ton

d) commodity type

e) annual tonnage of the commodity shipped

f) freight rate charged

g) transit time

h) measure of reliability

Most of these variables are concerned with the nature of the product rather than with the producing firm as a human activity system. This is in contract to the economic positivist approach which is concerned with the profit or cost profile of the firm. None of the above variables may be said to reveal such a profile, either singly or in combination. The concept of modal choice being associated primarily with the nature of the commodity is central to the technological positivist approach. If an analogy is drawn with an industrial production process, the commodity is processed (ie is transferred spatially) by machinery (ie the transport mode) which has performance specifications (eg transit time). In the technological positivist approach, the freight rate is not seen as data contributing to the analysis of the cost to the shipper as in the economic positivist approach, but simply as one more variable to describe a technological process. Thus, it has been found in some studies (eg Bayliss and Edwards (1970)) that the freight rate is not a significant determinant of modal choice.

The general form of the technological positivist approach is

Modal choice = F (modal characteristics, commodity attributes)

described, for example, in Watson et al (1974). Watson et al stress the empirical foundation of their study, describing how they select their variables, 'The primary emphasis in selecting variables for use in our model was that the variables be those we a priori believed most important to mode choice and also that they be measured so that the validity of using binary choice model forms of disaggregate freight data could be examined' (p 140).

In this case the binary choice model was a logit model. Logit analysis relates the probability that a given mode will be chosen to the independent variables hypothesised to influence that choice. The particular form of the model used by Watson et al is

$$\text{Probability of choosing a mode} = \frac{e^{(\alpha_0 + \alpha_1 \Delta T + \alpha_2 \Delta C)}}{1 + e^{(\alpha_0 + \alpha_1 \Delta T + \alpha_2 \Delta C)}}$$

where

T relative transit time

C relative cost

Formulations using relative transit time, reliability, and the value of the commodity were also tested. The model was found to have a high degree of internal accuracy, although it should be noted that the data consisted only of the shipments of a single firm.

The approach adopted by Stenger and Cunningham (1976) was to select five variables which the researchers considered to be important in freight modal choice. The variables were distance, region of origin, value of commodity, susceptibility to loss and damage, and existence of substitute or competing commodities (defined in terms of how late a delivery the customer will allow, based on the shipper's subjective assessment).

The researchers attempted by means of cluster analysis to minimise the number of clusters with shipments of more than one mode and to maximise the number of clusters with shipments of only one mode. Using combinations of up to five variables it was found that the best set of clusters was derived from four variables: distance, region of origin, value of commodity, and susceptibility to loss and damage.

Within the clusters Stenger and Cunningham undertook 'constraint analysis'. It was found that for any given distance there is a maximum value per unit weight beyond which rail movements are excluded, and that this value increases exponentially with distance. Thus, a value-distance constraint was applied to clusters, as was an 'availability of rail sidings' constraint. Having identified the 'natural markets' for either rail or road, either because they fall within a cluster which is not rail/road competitive or because they are not within the competitive constraints, Stenger and Cunningham attempted by means of discriminant analysis to identify the important characteristics which determine modal choice within the rail/road competitive area. The set of variables which was found to have the most internal predictive power was shipment size, type of receiver (retailer, manufacturer or wholesaler), production method (to stock or to order), and substitutability of commodity (as defined earlier). It was found that the only variable of any major significance in predicting modal choice within the competitive area was shipment size.

This result was not unexpected since the types of mode which were considered are to a large extent defined by their capacity. They are rail carload, trailer-on-flat-car, truckload (ie lorry load), less-than-truckload and freight-forwarder-shipper's association. Even the last mentioned mode may be classified by shipment size since the type of operator mentioned undertakes consolidation of smaller shipments. By and large, the variables selected describe a technological system in the sense outlined earlier in this section, although the subjective assessments of shippers are also prominent in the model. Some of the variables which are not obviously describing a technological process are revealed as such when examined more closely. For example, the area of origin is considered important since 'the origin and destination regions of a shipment may or may not influence mode choice, but it is certainly true that congestion in the north-east quadrant of the county [ie the USA] puts rail service at a disadvantage relative to trucks' (p 13). Likewise, the existence of substitute or competing commodities is defined in terms of maximum acceptable delivery times.

The studies in the United States by Watson et al and by Stenger and Cunningham used the shipment or consignment as the basic unit of analysis, a procedure which was also adopted in an earlier British study by Bayliss and Edwards (1970). They used multiple regression in a discriminant manner as a probability model where the regressand is treated as a dummy

variable, taking the value 1 if an event occurs and 0 if it does not. Thus, modal choice is expressed in the form

$$Y = f(X_1, X_2 \ldots\ldots Xn)$$

where

Y = 1 if the consignment went by mode A, and
0 if the consignment did not go by mode A.

X_1 etc are explanatory variables. The calculated value of Y is interpreted as the conditional probability of the consignment using mode A.

The analysis used twenty-five independent variables under the three broad headings of (a) factors relating to consignments, (b) factors relating to the firm, and (c) subjective assessments. The factors relating to consignments were length of haul; journey time; charge (cost of freight); consignment weight; regularity of shipment; container used; special body required; inter-establishment move; consignment required more urgently than usual; ancillary service performed; type of commodity; destination. The factors relating to the firm were origin; size of firm; ownership of rail siding; ownership of 'C' licence vehicles (or use of pool); vehicles under 'A contract'. The subjective assessments were knowledge of charge by alternative mode; charge by alternative mode; speed required to meet customers' requirements; speed required to ensure high utilisation of vehicles; speed required to maintain low stock levels; ready availability of vehicles; freedom from loss; freedom from damage.

All but four of the variables were entered as dummy variables, the exceptions being length of haul, journey time, weight and charge, which were entered as logarithmic values. The study attempted to explain the distribution of traffic in terms of a series of binary modal choices eg transport on own account versus professional (hire and reward) transport; rail versus transport on own account; rail versus road haulier. Length of haul was by far the most significant factor in the first two binary choices explaining 24% and 32% of the observed distribution of traffic between modes. Consignment weight was the most significant factor in explaining the distribution between rail and road haulier, although it explained only 7%. No other factors were shown to be significant.

The justification for including the study by Bayliss and Edwards under the heading of technological positivism is that variables directly measuring the performance of transport 'hardware' or associated processes are predominantly the assumed criteria for assessing modal choice. The subjective assessments appear to be classified separately by the researchers because they are on the whole 'measured' by the survey respondents rather than directly by the researchers. The factors relating to the firm are not economic factors of cost or profit but mainly technological factors, in particular transport related facilities.

The analysis of their results by Bayliss and Edwards has been criticised by Starkie (1971) who claims that 'length of haul' is a surrogate, and that the use of own transport decreases sharply with distance because of the legal restrictions on own-account operators in existence at the time of the survey. If this is correct it could be said that Bayliss and Edwards have provided a technological explanation for a social (specifically, legal) constraint.

A study by Morton (1972) examined intermodal competition for the inter-city transport of manufacturers in the USA, adopting the assumption that length of haul, shipment size and commodity are particularly critical for shippers when selecting a mode. Using the USA 1967 Commodity Transportation Survey, Morton examined each commodity class by mode, by distance and by weight to identify competitive weight-mileage 'blocks'. Excluding blocks in which either rail or for-hire road vehicles account for less than 10% of tonnage as 'non-competitive', Morton found that in terms of weight-miles, only about 25% of total tonnage and, in terms of mileage, about 60% of tonnage is competitive. Therefore, the shipment weight or size is important in determining the volume of traffic. Both types of transport had similar freight rates and carried similar products.

Since shippers have freedom to vary shipment sizes by altering inventory policies, either mode would appear to have considerable potential to attract business from the other. However, Morton speculates that shippers develop a particular factory design, inventory policy and marketing pattern which they perceive as committing them to one mode or the other. Morton concludes that 'important determinants of modal split and intermodal competition remain obscured in the ideosyncratic needs of shippers and consignees' (p 366).

2.5.3 Perceptual approach

In the technological positivist approach the selection of transport mode tends to be the dependent variable to a number of empirically selected independent variables related to the transport technology. The perceptual approach differs from the technological positivist approach by assuming that the independent variables are based primarily on the transport user's subjective interpretation of the situation rather than on physical attributes objectively measureable by the researcher. Thus the perceptions of the transport user assume importance. Perception has been defined as 'an active process, in which the individual selects from any available range of cues or stimuli, and goes beyond what is given in such a way that his experience is structured, stable and meaningful' (Roth 1976, p 22). Thus, the approach assumes that shippers of freight transport are able to adopt reasonably lasting impressions of transport services. The elements of selectivity and stability in perception may result in the establishment of stereotypes, that is, of biased generalisations towards particular transport modes.

Most studies relevant to this chapter, whatever the approach adopted, are likely to require the co-operation of the transport user. The essential difference between the perceptual approach and the other two approaches described here is that the unit of analysis is a person, although probably equated with the firm. In the economic positivist approach the unit of analysis is an economic value (eg marginal revenue) and in the technological positivist approach a unit of 'production' (eg a weight or a consignment). In common with the other approaches, perceptual studies do not appear to assume a divergence of interests between those of the perceiver and those of the firm (or of others in the firm), although such an approach may be implicit in using a particular subsection of the organisational membership as the unit of analysis.

Gilmour (1976) analysed 'the processes a sample of distribution managers and transportation managers perform when making the modal choice for freight movements between Melbourne and Sydney' (p 40). On the basis

that 'perceived product features' may be more likely to determine purchasing behaviour than 'actual performance characteristics' (p 45), Gilmour looked at the attitudes of users of transport services towards modal choice.

The research was in three main parts. First, respondents were asked to list factors which they were likely to consider when sending goods by a number of transport modes from Melbourne to Sydney. The modes were freight by own road transport, normal road service with a freight forwarder, overnight road service with a freight forwarder, unit train, normal rail freight, sea, and air. This part of the research was deliberately open-ended to avoid influencing the answers received from respondents. The second part of the research established similarity ratings for all possible pairs of the seven modes being considered. The aggregated similarity ratings were subsequently analysed by non-metric multi-dimensional scaling. Finally, respondents were asked to give an importance rating to each of forty-one factors gathered from the first stage and other sources. Cluster analysis was performed on the correlation coefficient matrix of the results of this survey and the underlying dimensions were used to define the configurations (the perceptual space) obtained from the non-metric multi-dimensional scaling analysis for each of five product groups of shipper.

The results suggested that the direct cost of transport is not an important determinant of modal choice, but that control over the shipment, availability of specialised equipment and reliability are important. Such characteristics favoured road over rail, air or sea. It is difficult to see how direct cost of transport cannot be an important determinant of modal choice when comparing, for example, unit train with air. Possibly the result reflects the structure of the study where the direct costs may be taken for granted in the assessment of the similarity ratings.

Cunningham and Kettlewood (1975) examined 'the image of British Rail as a freight tansporter as viewed by buyers in industrial enterprises' (p 238) with the objective of discovering 'what caused buyers to change from one source of transport to an alternative for the provision of a given service, it being recognised that all goods would not lend themselves to an automatic free choice between different forms of transport' (p 238).

The study attempted to measure buyers' attitudes to rail and to road freight hauliers. The forty-three subjects in the study were asked to rate supplied 'image' attributes and the results were then weighted by an 'importance ratio' attached to each attribute and derived from an independent sample. Two measures of attitude, the dissatisfaction ratio (DR) and the relative attitude ratio (RAR) were derived from the results of the surveys. The dissatisfaction ratio is measured as

$$DR = \frac{\Sigma awx}{\Sigma awi}$$

where

a attitude (ie score on 5-point bipolar scale for each attribute)

w importance weighting

x transport mode

i ideal mode (ie assumed to have the maximum weighted score for each attribute)

Therefore, the DR ranges from 0 to 1, the nearer 1 the more favourable the attitude towards the mode. The RAR is

$$RAR = \frac{\Sigma awr}{\Sigma awp}$$

where

r rail

p public road haulier.

Thus, where RAR is less than 1, the attitude toward British Rail is less favourable than that towards the road haulier, and the contrary applies where RAR is greater than 1. Cunningham and Kettlewood considered that the dissatisfaction ratio is 'a measure of the dissatisfaction gap, defined as the difference between the attitude to source [of transport] x and to an ideal source' and the relative attitude ratio 'measures the gap between attitudes towards a road haulier and to British Rail at the same point in time (p247).

Public road transport was found to be closer to the 'ideal' source of transport for all attributes, with the greatest difference between the modes shown for the attributes 'competitive in price', 'reliable deliveries' and 'faster transit times'.

2.5.4 Comparison of subjective and objective attributes

Miklius and Casavant (1975) attempted to compare shippers' perceptions with actual performance of transport modes, and by doing so relate experience to the technological positivist approach. Such studies are rare in freight modal choice, either because assumptions of perfect knowledge or economic rationality consider them to be unnecessary or possibly because of the difficulty in gathering such data. Miklius and Casavant had the objectives (a) to quantify and compare reliability of delivery time for rail and truck (lorry) and (b) to compare the actual reliability of delivery time to that perceived by shippers (p 48).

The data on actual transit times was obtained from the records of shipments of cherries in the USA. Based on a sample of nearly two thousand road and nearly one thousand rail shipments it was found there there was no significant difference in variability of transit time between rail and road. The perceived variability of transit time was obtained by asking seventy produce buyers for both road and rail how many of one hundred shipments would arrive on the promised day, one day late, two days late etc. It was found that the expected delay perceived by shippers was much greater than the estimated mean delay based on the survey of actual shipments. Furthermore, it was found that the difference between the estimated and perceived variability of transit times was much worse for rail than for road.

Miklius and Casavant concluded that either the perceived delays may have been disproportionately influenced by a few long transit times or that perceptions by shippers may not have kept up with the improvements in the reliability of rail services which were widely held to have taken place. In other words, rail had become stereotyped as offering poorer transit times.

2.6 The nature of modes

This chapter has reserved its consideration of modal choice to those situations where the researcher claims to attempt to describe the decision making or judgements of shippers. In other words, discussion has been about the nature of 'choice'. However, little has been said about the nature of modes. Although justification is often given for the 'choice' model adopted in the study, the selection of modes sometimes appears arbitrary; possibly, in an applied research area, justified by the requirements of the agency sponsoring the research.

The study by Bayliss and Edwards (1970) includes three binary modal choice analyses which refer to the distribution of transport between vehicles owned by the shipper and hire and reward vehicles. As indicated in section 2.5.2, Starkie (1971) has criticised this approach since the results suggest that 'length of haul' is the overwhelming determinant of modal choice, whereas it is almost certainly a surrogate for a pattern of ownership of vehicle based on specific legal restrictions in existence at the time of the study.

Stenger and Cunningham (1976) defined the modes mainly by their carrying capacity and the only variable of any major significance in predicting modal choice in the product area competitive between road and rail was shipment size. (See section 2.5.2 for further discussion).

The results of other studies are not apparently directly related to the modes selected, but it is worth indicating the plurality of bases for selecting modes in some studies. Gilmour (1976) has a selection of modes based partly on ownership patterns (own transport compared with hire and reward transport), and partly on a within-mode transit time differential (overnight road compared with normal road).

It is possible to identify four major classifications of mode in the studies in this chapter. These are

a) evident physical differences (eg air compared with road)

b) in terms of pattern of ownership (ownership by the shipper or ownership by the transport operator). The organisational relationships between the shipper and the transport world would appear to be underestimated in studies as an explanation of modal choice. The movement of goods is seldom perceived by researchers as an inter-organisational social system, although it is often a principal factor (possibly unwittingly) in the definition of modes in some studies. For example, socio-organisational factors would appear to be relevant to the choice between using the shipper's own vehicles and using those of professional hauliers, or between using British Rail (a monopoly operator) and road transport (a highly competitive market).

c) potential size of consignment. This refers to the constraints placed on the consignment size by the mode. Weight or volume constraints may arise from the physical limitations of the transport equipment or from constraints resulting from the operating system. The most common example of this is a service which offers consolidation (groupage, less than full load).

d) abstract mode. This approach, described in section 2.5.1 treats 'all modes as variants of a single prototype with different values of the attribute variables' (Baumol & Vinod 1970, p 413). The concept

of continuity of measurement is usful in the area of research into freight transport when, as Baumol and Vinod indicate, the often sparse data divided by modal or commodity categories may provide a richer source of information when considered as continuous data. However, it is not always easy to establish continuity. For example, Baumol and Vinod admit the difficulty which their model would have in distinguishing between full loads and less than full loads (treated as different modes) owing to the step-wise relationship of freight rates.

2.7 Conceptual links between the three approaches

The three basic categories of the economic positivist, technological positivist and perceptual approaches were adopted as a means to understanding the nature of freight modal choice models at the level of the firm. However, we are concerned with a system consisting of interacting economic, technological and human social elements, and it is instructive to examine the evidence of similarities between the research approaches. Links between the approaches are possible to trace through two assumptions from neoclassical microeconomic theory. These are

a) the assumption of utility maximising

b) the assumption of perfect knowledge.

Utility is applied in classical economic demand theory to a satisfaction derived from consuming some quantity of a good. Owing to the difficulty of measuring utility in absolute terms such economists as Hicks and Allen (see Bannock et al 1972) have redefined utility to refer to an ordinal attribute, that is, to a consumer's preference for a particular combination of goods in contrast to another combination. Economic rationality assumes utility maximisation, and the concept has been adopted by decision theorists eg von Neumann and Morgenstern (1944) and Fishburn (1964). Luce and Raiffa (1957) have outlined utility axioms which include the assumptions that decision makers either prefer one alternative to another or are indifferent between them. If the choices are indifferent they can be substituted for each other. Where there is more than one potential choice, each may be decomposed into separate choices with particular probabilities, and the decision maker will choose the alternative with the greater probability.

The assumption that the behaviour of shippers is utility-maximising, usually in a binary choice situation, is common to both the economic positivist and the technological positivist approaches - see, for example, the models of Beuthe, (section 2.5.1), and Watson et al and Bayliss and Edwards (section 2.5.2). Most freight modal choice models operate within a 'simple' utility maximising framework. They are 'simple' in the sense that a single decision maker, or the single view of a consensus of decision makers, is assumed. A basic difference between the economic approach and the technological approach is that the utility in the former is equated with profit-maximisation of the shipper firm, whereas the utility in the technological positivist approach is an optimal combination of technological factors.

The assumption of perfect knowledge in the neoclassical economic theory of the firm provides another link between the approaches. There has been little work on the extent of knowledge of shippers in the area of freight modal choice. The lack of research is perhaps a result of

economistic assumptions as much as a result of the difficulty of obtaining such data. For example, Baumol and Vinod (1970) are confident in their selection of attributes to describe the abstract mode, claiming,

' the choice of mode by a passenger is ultimately a psychic matter of consumer desires in which the economist is able to say only that travellers prefer whatever they happen to prefer. Since no pleasure is ordinarily derived from the means chosen for freight transportation, the selection of a carrier is likely to be based on economic considerations that are amenable to formal analysis' (p413).

Perception by the shipper is implicit in many of the studies in the economic and technological positivist categories. For example, the abstract mode approach proposes that the mode is defined only in terms of attributes known to the shipper, thus excluding the type of fuel used but including the transit time. However, the writers are assuming that a shipper views his freight movements in terms of inventory theoretic cost functions, taking into account capital tied up in transit etc. Possibly this is true for some firms, but the author has found no study providing empirical evidence for or against this assumption. Despite the growth of prescriptive management teaching in the area of logistics, or the considerable campaign by airlines to sell total distribution costing (see chapter 13), it is difficult to accept that all shippers take such factors into account.

Throughout modal choice studies one find reference to the difficulties of data collection. The U.S. Transportation Research Board claims that 'the inconclusiveness of results obtained is usually attributed to problems of data availability' (p 82). Roberts (1971) describing the application of his model to the individual shipper, says, 'data could present a problem with this model since a great deal more information is required than for most inventory models' (p 145). Pike, Wallance and Hughes (1979) provide a detailed account of the difficulty which researchers into freight transport face in obtaining data from shippers, describing five types of problem which they have encountered. The problems are a need to establish proper avenues of communication, the time required to persuade reluctant companies to participate, the time taken to obtain data, the depth of data obtained and the difficulties in reading, manipulating and ordering the data, and inconsistency of data between firms.

There are of course two levels of knowledge. First, there is the level of knowledge of the researcher described in the previous paragraph and, second, there is the level of knowledge of the shipper which, for the relevant variables, need not necessarily be the same as that of the researcher. Considering the level of knowledge of the shipper, Miklius and Casavant (1975) suggest that there may be a difference between perceived and actual transit times. Bayliss and Edwards (1970) found that less than half of the firms in their survey knew the costs of transport by alternative modes for some or all of their consignments, and a smaller proportion of firms were able to provide alternative charges for actual consignments. They suggest that the shipper is not necessarily acting irrationally when he does not seek knowledge of the cost of alternatives since he may base his actions on a general idea of alternative charges. The concept of a 'general idea' requires a subjective approach, since it cannot be assumed that all shippers will have the same general idea or, in the case of the price of transport, that it will necessarily be an isolated perception of price. It is

possible that the perceived price may be linked to other attributes forming the 'image' of the mode (see Cunningham and Kettlewood (1975)). If a pure positivist approach is adopted, the perceptions of the shipper are, of course, irrelevant, since the objective cost attributes or technological system attributes determine the modal choice and may be measured independently of the shipper's perceptions. However, such a pure approach is not adopted in the studies described in this chapter and assumptions are generally made about the shippers' knowledge, if only implicitly.

2.8 · Summary

The chapter examines the classificatory systems used by other writers when reviewing modal choice literature. It establishes the difference between 'modal split' analyses used for freight forecasting purposes and 'modal choice' analyses used to discover the underlying reasons of shippers for employing particular modes. The latter form of analyses attempt to replicate the decision making processes of shippers.

Typical problems encountered in any freight demand study are the appropriate level of aggregation and homogeneity, the variables to be used and the unit of analysis. If the same assumptions about modal choice are made at different levels of aggregation there is the danger of committing cross-level fallacies, in particular the fallacy of assuming that what is true for groups (ie at one level of aggregation) is true for individuals; in this case, at the level of the individual firm. In most freight modal choice models the firm is treated as an individual decision maker (the following chapter examines the validity of this assumption).

The level of the firm is sometimes called the disaggregate level, although this is terminologically inappropriate since it suggests a logical and direct continuity between 'modal split' and 'modal choice' models. At this level three basic approaches are identified. Two approaches are positivistic in the sense that human action is presumed to be determined by relations between costs, in the economic positivist approach, and between technological pheomena, in the technological positivist approach. The human component is explained by the assumption of rationality based on knowledge of the measurements of the variables which constitute the utility-maximising model. A third approach, the perceptual approach, accepts that the shipper's choice of mode may be based on known variables which have been subjectively interpreted (eg transit times) and on relatively inaccessible (by the researcher) underlying perceptual dimensions which are difficult to express in the formal mathematical terms of utility maximising models.

Most studies in each of the three approaches offer an explanation of the nature of choice as interpreted by the researcher, but researchers often do not explain their selection of 'modes', although the nature of modal classification is likely to influence the nature of the choice procedure.

This chapter has examined research approaches to the selection of freight transport services at a specific level of aggregation, the firm, whether considered as a profit maximising unit, as a consignment processing unit, or as a data interpreting unit. The specialist area of modal choice research described in this chapter has developed with its own tradition,

largely positivistic and derived from aggregate models of freight demand for transport planning. However, disaggregate modal choice may be seen as a particular instance of organisational buying behaviour, which also has an established tradition of research, and which is the subject of the following chapter.

CHAPTER 3. ORGANISATIONAL BUYING BEHAVIOUR

3.1 Introduction

The previous chapter examined freight modal choice models at the level of the firm, sometimes called the disaggregate level. One of the approaches was described as the perceptual approach in which the perceptions of the shipper assume importance. By taking account of perceptions the approach tacitly admits individuals as the unit of analysis, unlike the other approaches which are deterministic either in a technological or an economic sense. Organisational buying behaviour is another area of study which is also concerned with decision making (which includes modal choice) as a human activity, examining the demand for goods and services primarily from the standpoint of the decision process directly leading to the purchasing act. The chapter describes the research area in terms of goods and services in general and then outlines some empirical studies which have examined the purchase of freight transport.

The previous chapter described how different studies have provided different methods of defining 'mode'. The study of organisational buying behaviour is concerned primarily with the selection of suppliers offering similar products, mainly as the result of the impetus of research developed to assist marketing companies in improving their marketing skills. Therefore, the approach described in this chapter is particularly appropriate for examining the selection of different suppliers within a given freight transport mode, where the alternative types of transport may not necessarily be differentiated by technological or economic factors, although such factors are not necessarily excluded from consideration. In this respect it is able to provide insights into freight modal choice which may not be possible with many of the models described in the preceding chapter.

3.2 The academic approach to organisational buying behaviour

In a market economy all organisations involved in obtaining goods or services from sources outside the organisation must undertake organisational buying which, apart from the basic transaction of exchanging money for goods and services involves decision-making and communica tion both within the organisation and with parties outside the organisation. The chapter will show that the activity of organisational buying may involve a number of different people. Organisational buying behaviour has been defined as 'the decision-making process by which formal organisations establish the need for purchased products and services, and identify, evaluate, and choose among alternative brands and suppliers' (Webster and Wind, 1972a). In the above definition 'decision-making' refers not only to the gathering and processing of information but also to the processes of choice and the development of goals. Industrial buying behaviour may be considered a particular application of organisational buying behaviour, although the terms will be considered interchangeable in this chapter depending on the preference of the writer whose work is being reviewed. Otherwise the term 'organisational buying behaviour' will be used.

The main purpose of studies in organisational buying behaviour is to obtain knowledge of buying behaviour for people or organisations wishing to develop their marketing skills. This is apparent from the journals in which many of the articles about organisational buying behaviour appear. They include the Journal of Marketing, the Journal of Marketing Research, Industrial Marketing Management, and the European Journal of Marketing. Webster and Wind (1972a) give three major practical values of studying organisational buying behaviour based on the behavioural sciences. These are

'1. It can help identify, guide and evaluate the need for market information - ie, it can suggest which factors are most likely to affect the market's response to marketing effort,and hence which are worth gathering information about.

2. It can significantly aid in the analysis and interpretation of available information about the market, whether systematically gathered through marketing research or obtained in the normal conduct of business.

3. It can improve the value of predictions about and understanding of market response, hence improving the firm's marketing strategies toward the various organisational market segments.' (Webster and Wind, 1972a p5).

There is no shortage of articles on organisation buying behaviour and Sheth (1976) was able to find more than a thousand references to the subject, claiming that there are more journals specialising in industrial buying behaviour than in consumer behaviour, However, most of the articles are directed at practising managers in business rather than being what Sheth calls 'academic-orientated' (p1). That there should be an academic interest directed at a specific practical area of commercial activity reflects the growth of marketing as an academic subject in the past decade. Since the mid-1960s an academic tradition of study in organisational buying behaviour has developed and this chapter restricts itself to writings in this academic area rather than including the great volume of literature directed solely at practising managers.

This is not to suggest that there is clear division between 'academic' and 'practical' works, since a survey of the literature reveals an indistinct boundary between writings directed at practitioners of marketing or purchasing and writings directed at researchers or academics. Several studies direct themselves at a dual audience. For example, Bonoma and Johnston (1978) describe the implications of their work 'for the theorist' and 'for managers' in separate sections. For the purposes of this chapter 'academic' writings are considered those which attempt to establish generalisable models or concepts or which orientate themselves in an academic tradition, either in the tradition of research into organisational buying behaviour (which is described in this chapter) or in the disciplines from which the studies derive (eg economics, sociology, social psychology). This policy is adopted to enable a coherent theoretical framework to be developed, so that the validity of organisational buying behaviour as an academic subject relevant to this thesis may be properly assessed.

3.3 Research approaches to organisational buying behaviour

A review of the organisational buying literature shows that, as an

academic research subject, it has developed mainly since the mid-1960s. It is possible by examining a number of state-of-the-art reviews made during the period since that time to identify the types of conceptual and theoretical problems encountered by academics in the area of organisational buying behaviour.

In a work published in 1965 (Webster 1965) it is claimed that practically all industrial purchasing writings up to that time had been descriptive case studies and that little attempt had been made to identify key variables and relationships to form an analytical structure. In his work which was published two years after Cyert and March's (1963) influential 'A Behavioural Theory of the Firm', Webster suggests a research approach which derives largely from that work and associated work (eg March and Simon, 1958). The following chapter will discuss the influence of these works on organisational buying behaviour studies and place them in their sociological and social psychological context in an appropriate form for the purposes of the theoretical development of this thesis. The model proposed by Webster is described in section 3.5 of this chapter.

In a work published in 1972 (Webster and Wind, 1972a) it is suggested that organisational buying behaviour models may be categorised as 'task' or 'nontask' models. Task-orientated models are those which examine variables directly related to the buying task (eg price) whereas nontask-orientated models examine variables which are less obviously related to the task, but, nevertheless, may influence greatly the outcome of the task (eg the buyer's motives).

Webster and Wind suggest that nontask models tend to underplay the main objective of a buying organisation which is to make purchases in exchange for money. Both the task and nontask models present a very limited picture of a complex activity which involves individual, group, organisational and environmental variables. Webster and Wind conclude that owing to the complexity of the organisational buying process it is unlikely that single-variable models will be valid or reliable. After describing a number of complex models which take into account a wide range of variables, Webster and Wind state that there is a need for an integrated model of organisational buying behaviour which must 'recognise the complex interaction of task and nontask variables and of individual, group, organisational, and environmental factors in determining response to marketing effort. It must also recognise the alternative forms of buying response and the sequential nature of the organisational buying decision process' (p27). Complex or integrated models will be considered separately in this chapter in section 3.5.

Sheth (1976) in a review of research into organisational buying behaviour suggests that it may be classified into the following main areas

a) type of buying decisions

b) evaluation of the buying task

c) decision-making process underlying buying decisions

d) marketing communications and their influences on the decision-making process

e) impact of individual decision maker's characteristics on the decision-making process

f) impact of organisational characteristics on the decision-making process

g) impact of specific purchase situation characteristics on the decision-making process.

Sheth sees the totality of the research interrelated in the form portrayed in figure 3.1.

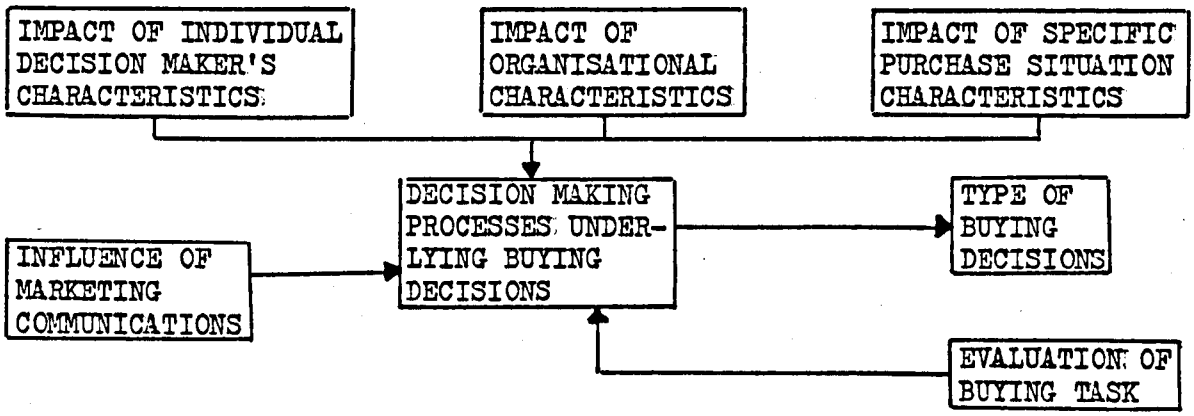

Figure 3.1. Sheth's description of organisational buying behaviour research (adapted from Sheth (1976) p3)

The types of buying decisions may be divided into the two main categories of (a) behavioural acts or ultimate choices and (b) process decisions. The types of behavioural acts or ultimate choices are product selection, supplier selection, reciprocal buying by two organisations, the decision whether to buy or lease, the decision whether to make the product internally or to buy it from outside sources. Process decisions are concerned not so much with the ultimate act of buying but with the types of decision processes containing the search for information, the evaluation of suppliers, and supplier selection. Evaluation of the buying task refers to approaches which attempt to quantify the economic value of a purchase to an organisation, often supplying a set of decision rules where the outcome may be expressed in money terms.

The decision-making processes underlying organisational buying may be classified into studies adopting either an economic, an organisational or a behavioural approach. There are a wide range of approaches grounded in economic theory including the probabilistic decision theory approach which quantifies the expected payoff from supplier selection, the examination of financial ratios of suppliers as indications of their acceptability to the purchaser, the economic learning curve approach applied to purchasing organisations, the analysis of the competitive bidding process using game theory, input-output analysis where the purchasing function provides such inputs as raw materials required for the organisational output, and, finally, purchasing activity related to the life-cycle of the product manufactured by the purchasing organisation.

The organisational approach, in contrast to the economic approach, has tended, according to Sheth, to be more descriptive and less quantitative. He identifies four organisational approaches which have been applied to

organisational buying. They are the approach which portrays the purchasing agent as a rational economic man, the approach which describes the purchasing function in terms of a mechanistic work-flow (derived from time-and-motion studies), the organisational decision making approach which involves the identification of goals, the search for and the evaluation of alternatives requiring some rational decision rule, and the approach which undertakes the analysis of purchasing decisions in terms of organisational consensus, hierarchy and bargaining processes. The difference between the organisational decision making approach and the rational economic man approach is that the legitimacy of objectives are not necessarily grounded in any predefined rationality. The organisational approaches differ from the economic approaches in placing more emphasis on behavioural and non-economic factors. However, such approaches focus on the organisation rather than on the individuals undertaking the decisions.

There are several approaches which are included in the behavioural decision making category. The approach based on the behavioural theory of the firm developed by Cyert and March (1963) depicts the behaviour of individuals or small groups in terms of four interacting aspects of decision making. These are the conflict amongst decision makers and its partial resolution, the avoidance of uncertainty by establishing decision rules, the restriction of the information search to a narrow field, and organisational learning resulting from the repetition of activities. The group dynamics approach is very similar and studies the interactions among individuals in purchasing, focusing on conflict resolution and the tactics used to resolve the conflict. The innovation-adoption approach portrays the decision making process as a sequence of awareness, interest, evaluation, trial and adoption stages. The hierarchy of effects approach is very similar, a common form of this approach consisting of a model of the sequence of attention, interest, desire and action in the mental process employed in making buying decisions. The salient criteria approach is used to evaluate suppliers, usually in terms of attitudinal rating scales. According to Sheth, this approach has been used mainly in practical situations without relying on any particular behavioural theory. The final behavioural approach is derived from information-processing and cognitive consistency theories in social psychology. It examines the type of decision rules adopted by individuals when confronted with information about suppliers or other relevant factors. Sheth concludes that although the many different approaches within the economic, organisational and behavioural viewpoints are able to provide a partial explanation of buying behaviour, there is an urgent need for an integration of the viewpoints into a comprehensive theory of organisational buying behaviour.

The area of study concerned with the influence of marketing communication examines the impact of the seller's information processes on the buyer. Sheth concludes that despite a number of ad hoc studies, there are only two areas of marketing communcation where a substantial body of knowledge exists. These are the buyer-seller interaction process at both the individual level and the organisational level, and the influence of word-of-mouth communication.

The impact of the individual decision maker's characteristics on the decision making process has, according to Sheth, been researched along

six dimensions. These are demographic variables (age, education, length of employment etc), personality and lifestyle profiles, perceptual differences among buyers regarding the criteria upon which decisions are made, the relative impact of rational or emotional criteria in the selection of suppliers, the application of perceived risk theory, and the application of psychological learning theories where differences among buyers in their decision making is explained in terms of differences in learning stages. Over a period of time the purchasing decisions become routine and uncertainty and perception of risk are lowered.

Sheth considers that there has been limited research into the impact of organisational characteristics on the decision making processes of buyers, and studies have tended to concentrate on the role of purchasing departments, lateral and vertical relationships of the purchasing decision process to the organisational hierarchy, demographics of the organisation, and the organisational style (whether centralised or decentralised).

Sheth identifies four distinct classes of purchasing situation which have an impact on the decision making process. These are the type of purchase involved, the business climate at the time of purchase, the relationship between specific individuals involved in the purchase on both the buying and selling sides, and legal-political considerations, particularly in international trade.

In his conclusion, Sheth states that researchers are preoccupied with descriptive decision making processes in the belief that organisational buying behaviour may be explained in that way. On the other hand, there has been little research based on market segmentation (ie classifying purchasers according to some common characteristic) which he attributes to the orientation of industrial marketeers towards products and selling techniques. Other areas where there is a shortage or research are the study of situational variables which explain unexpected events (eg changes in top management leadership), studies which examine the relationship between purchasing and other organisational functions, and studies which examine the impact of marketing communication on the decision making process. As with Webster and Wind (1972a), Sheth considers that there should be an attempt to integrate the various economic, organisational and behavioural theories into 'a comprehensive theory of organisational buyer behaviour' (Sheth 1976 p28)

Nicosia and Wind (1977) assess the state-of-the-art of organisational buying behaviour in terms of the methodological and substantive choices that have to be made when studying organisational processes, the major trends in the study of organisational buying behaviour, and the basic dimensions of the organisational processes which have emerged from these trends. When the researcher has formulated the problem, the key choices which he must make are the level of the unit of analysis, the selection of the dependent and independent variables, the nature of the association between the variables, the type of model and the nature of analysis. The unit of analysis may range from the individual purchasing agent, through the buying centre and the entire purchasing organisation to the market in aggregate. Nicosia and Wind claim that most current research uses the individual as the unit of analysis rather than examining groups. They suggest that studies of organisational buying behaviour present a wide range of potential dependent

variables, each of which require a different treatment. The dependent variables may include the purchase of a given product or service, the amount purchased, the specific brand selected, the brand loyalty pattern, the decision process of an individual or department, a purchasing activity (eg preparing a requisition), the buyer's attitude to vendors, and, finally, the criteria used by buyers in selecting vendors. In many situations it is possible that some of these 'dependent' variables may serve as independent or explanatory variables.

Both dependent and independent variables are usually placed under the four broad categories of (a) general organisational characteristics (eg type of product, size of company, financial resources, technology used, geographical location), (b) situational-specific organisational characteristics (eg type of purchases, criteria for vendor selection), (c) general characteristics of the individual decision maker(s) (eg age, sex, personality), (d) situation-specific characteristics of the individual decision maker(s) (eg attitude towards vendors).

Nicosia and Wind examine past and current trends in the study of organisational buying, assessing past trends by academic discipline and current trends in terms of interdisciplinary models. The disciplines referred to by them are marketing and purchasing, and economics. In the area of marketing and purchasing both the professional and the academic literature offer a prescriptive approach based on marketing principles or purchasing principles which should lead, respectively, to more profitable sales or improved buying procedures. They divide economic models into two classes which have had some impact on the study of organisational buying processes. The class which they call 'managerial economics' refers to studies which seek optimal decisions using a utility function as, for example, in the area of inventory control, or warehouse location. The class which they call 'industrial organisation theory' is concerned with the economic relationships among firms in terms of inputs and outputs. Nicosia and Wind consider that such economic approaches, although providing an understanding of the buying function, are essentially concerned with decisions rather than with decision processes, and are therefore limited in their explanation of organisational buying behaviour.

In contrast to the more traditional approaches, the approach adopted in what Nicosia and Wind call the 'emerging literature' recognises the complexity of a process in which the interaction between individuals and groups takes place. Such an approach, portrayed in emerging interdisciplinary models, focuses on processes which require the description of activities and interactions in detail over time. The approach is descriptive rather than normative and makes no use of the concept of economic rationality in the context of an observer- or researcher-defined utility function. Instead, the rationality of the approach should be defined in terms of the research subject's preferences. In contrast to the traditional approaches which are only concerned with activities, the interdisciplinary approach considers it essential to observe both people (as individuals and in groups) and activities. The major problem areas w hich the emerging interdisciplinary approach appears to be investigating include studies of the number and type of people involved in purchasing decision processes, the relationship between the individual and the group, and the relationship between the formal and the enacted organisational role.

Ferguson (1978) considers that there is a fundamental difference in the nature of industrial buying behaviour literature prior to and after 1970. The literature prior to 1970 may be divided into the three categories of conceptual studies, elementary model development studies, and first generation models. Ferguson does not define what he means exactly by conceptual studies, but his review of the literature suggests that this type of study refers to those which attempt to explain organisational buying behaviour in terms of concepts derived from other disciplines and which do not consider more than a single phase of the process of buying. In contrast, elementary model development studies are those which include more than a single phase. He considers first generation models to be unscientific in lacking clearly defined hypotheses.

Ferguson considers that there has been a radical change in the industrial buying behaviour literature since 1970 in the direction of stated hypotheses, planned data collection and criteria for accepting and rejecting hypotheses. He suggests that there is more cross-fertilisation between individual studies and between industrial buying behaviour research and such other areas as 'consumer behaviour, communications theory, quantitative methods, regression analysis, or managerial decision theory' (p227). He distinguishes between models which attempt to explain the total buying process and all other research into industrial purchasing which he places in the three broad categories of techniques, communications and decision making.

Under the heading of 'techniques' Ferguson includes the effect of price competition, the application of market segmentation, the application of project planning and control, and conjoint measurement. The last two mentioned are techniques, but it is not clear why the first two items are considered as such by Ferguson. 'Communications theory' refers to information processing, and 'decision theory' for Ferguson refers to such procedures as buying games which examine risk tolerance and decision making styles of buyers.

In an assessment of the limited impact of studies in industrial buying behaviour on marketing thought and practice, Bonoma and Johnston (1978) are critical of a number of basic assumptions which have traditionally been adopted in the study area. They criticise the 'separation' assumption which states that it is possible to obtain an understanding of industrial buying behaviour merely by looking at the buyer or the buying centre without taking the seller into consideration. They suggest that it would be more suitable to adopt a 'dyadic' model or 'system' model. The dyadic model portrays buying as a process which is interactive with selling where the buyer-seller dyad is the basic unit of analysis. The systems approach, as described by Bonoma and Johnston, portrays a wider interaction between the buying and selling organisations in which the buyer-seller dyad may be seen as a subsystem.

A second assumption criticised by Bonoma and Johnston is that industrial buying behaviour is best considered in terms of stimulus-response (S-R) where the purchasing act is a response to a number of stimuli, for example, trade promotions. Bonoma and Johnston consider organisational buying behaviour to be transactional rather than reactional on the part of the buyer. The third traditional assumption is that organisational buying behaviour involves rational decisions based primarily on cost factors, whereas Bonoma and Johnston claim that the major factors influencing decisions are social rather than rational-economic. By

'social' they mean such factors as friendship between individual buyers and sellers. The final assumption criticised by Bonoma and Johnston is that the processes involved in organisational buying behaviour are different from those in the consumer market, since industrial purchasing involves a number of individuals in any purchasing decision, and it concerns different types of goods and promotional tactics from consumer purchasing. They consider that there is room for comparability between organisational buying behaviour and consumer buying behaviour where common types of interaction can be identified.

In the opinion of Bonoma and Johnston, the traditional assumptions have inhibited developments in understanding, particularly the assumption of separation between industrial marketing behaviour and industrial buying behaviour. They consider that this assumption has led to an approach which ignores the relational aspects of social behaviour which are crucial to the understanding of any social situation.

3.4 Summary of the state-of-the-art reviews of organisational buying behaviour research

Webster (1965) suggests a need to move away from descriptive studies and to develop an analytic structure using identified key variables and relationships. Webster and Wind (1972a) propose that models may be divided into task and non-task models, or, in other words, into models based on economic factors and those based on non-economic and behavioural factors. They suggest the need for integrated models which recognise the complexity of variables involved in the buying process and which allow for the interaction of task and non-task variables. Such models should also take into account the different levels of activity - the individual, the group, the organisation and the environment. Sheth(1976) sees decision making as the central point of study in organisational buying behaviour and, in particular, the decision making processes underlying buying decisions. He stresses the need for an approach which integrates the economic, organisational and behavioural viewpoints. Nicosia and Wind (1977) suggest that models should not be rational in a utility maximising sense, but should describe events without a preconceived rationality assumed for the subjects. Furthermore, individuals should be described in the context of the group and they claim that there is a trend towards such models in the 'emerging literature'. Ferguson (1978) is another writer who considers that there has been a development towards integrated models which are less likely to provide a 'distorted' view of the total buying process. In contrast to the other writers Bonoma and Johnston (1978) do not advocate a move towards more general integrated models but suggest that there is insufficient emphasis on the transactional aspect of buying (the buying-selling interface) and that there has been too much consideration of the interrelationships within the buying organisation. It would appear that their standpoint is contrary to the general inclination towards integrated models.

3.5 Integrated models of organisational buying behaviour

Most of the reviews of the state-of-the-art in organisational buying

behaviour have suggested the need for integrated models. This section describes a number of such models.

Webster (1965) developed a model intended to provide a conceptual framework for the study of the industrial buying process. According to Webster 'industrial buying decisions are made by individuals functioning as part of an organisation. To understand the industrial buying process, therefore, one must study both individual and organisational decision making' (p370). Webster based his model upon interviews with about 135 individuals in seventy-five companies and did not intend that it should have any predictive ability, but that it should be seen as a model for explanation. He presents an analytical structure which sees the buying process in four parts, which are (a) problem recognition, (b) buying responsibility, (c) search process, and (d) the choice process. Problems to be recognised exist when performance does not conform to goals, owing to either a change in goals or performance. Buying responsibility refers to the responsibility of individuals in making buying decisions, and this is influenced by a wide range of factors. The search process refers to information gathering and ranges from routine methods to the highly expensive complex methods of search activity required when information is sought from new sources. The choice process is the final stage of decision making and is closely connected with the search process since the order in which alternatives are identified during the search process will influence the nature of the choice. Webster sees his model as a 'start towards rationalisation of the industrial buying process' (p375), and, in particular, he sees a need for establishing precision in the definition and measurement of variables and the nature of causal relationships.

Robinson and Faris (1967) describe 'a specific classification system of the industrial buying process which appears to be useful from the point of view of the planning and execution of an efficient industrial marketing effort' (p11). The conceptual framework for their analysis of industrial buying is called 'buygrid' in which 'buyphases' are assessed against 'buyclasses'. Robinson and Faris, based on a detailed study of three firms and their dealings with hundreds of vendors involving thousands of transactions, suggest that there are eight buyphases which may be considered fundamental activities of the procurement process. The procurement process is 'the sequence of activities which must be performed in the resolution of a buying situation' (p12), the buying situation being the central unit of analysis in their study. The eight buyphases are (a) anticipation or recognition of a problem (or a need) and a general solution, (b) determination of characteristics and quantity of the needed item, (c) description of the characteristics and quantity of the needed item, (d) search for and qualification of potential sources, (e) acquisition and analysis of proposals, (f) evaluation of proposals and selection of supplier(s), (g) selection of an order routine, (h) performance feedback and evaluation.

Robinson and Faris consider that there are three basic types of buying situation or buyclasses, which are (a) new task, (b) straight rebuy, and (c) modified rebuy. The 'new task' type of buying situation occurs when the buyer is looking for a product or service to perform a new task, for example when the purchasing company starts manufacturing a new product. The 'straight rebuy' type of buying situation is the most common in industrial purchasing referring to when the buyer considers the same range of solutions as he took into account at the

previous purchase. It does not mean that the buyer necessarily purchases exactly the same material or even from the same supplier, although selection would be from a previously considered range of options. The difference between the 'modified rebuy' type of buying situation and the straight rebuy is that in the modified rebuy situation the buyer undertakes a re-evaluation of the alternatives offered to him. Robinson and Faris suggest that the modified rebuy is likely to occur as the result of one of four factors. These are where the buyers decide that a re-evaluation of buying alternatives may provide noticeable improvements, where the buying organisation is not satisfied with a current supplier, where a supplier or competitor makes a significant change in his marketing effort (eg a major price or quality or service change), and where there is a significant change in the buying organisation's requirements, for example in the quantity of a product required as a result of greatly increased output. Robinson and Faris propose that the buygrid may be used to examine the fundamental difference among buying situations in different firms or for different types of products.

Webster and Wind (1972a and 1972b) describe a general model for understanding organisational buying behaviour which they consider applicable to all organisational buying. The model is intended to identify the classes of variables involved in organisational buying behaviour rather than to present a framework for describing or predicting the outcome of specific situations. Webster and Wind base their model on the assertion that 'organisational buying is a decision making process carried out by individuals, in interaction with other people, in the context of a formal organisation. The organisation, in turn, is influenced by a variety of forces in the environment' (Webster and Wind 1972b p13). Thus the model encompasses variables based on the individual person, the social group, the organisation, and the environment. Within each of these four classes there are two types of variables called 'task variables' and 'nontask variables' (described in section 3.3). Organisation buying behaviour is not an instantaneous act, but is a process which is a form of problem solving, and a buying situation results from the perception of a problem.

The organisational members involved in organisational buying behaviour together constitute the 'buying centre' (Webster and Wind 1972b p14). Members of the buying centre may undertake one or more of five roles, which are those of user, influencer, decider, buyer and gatekeeper. Users refer to those organisational members actually using the products or services purchased; buyers are those formally responsible for contacting suppliers; influencers influence the decision process either by providing information or methods of evaluating purchases; deciders are those with the authority to choose alternative actions; and gatekeepers are those who control the flow of information and materials into the buying centre (1972b p14).

Sheth (1973) describes an integrative model which is intended 'first, to broaden the vision of research on organisational buyer behaviour so that it includes the most salient elements and their interactions; second, to act as a catalyst for building marketing information systems from the viewpoint of the industrial buyer; and, third, to generate new hypotheses for future research on fundamental processes underlying organisational buyer behaviour' (p51). The model is complex but, as Sheth indicates, the application of it may be simplified by holding some variables constant (eg product-specific factors) or by ignoring some

of the variables. For example, decision process variables may be ignored where the psychology of organisational buyers is the object of study.

Sheth considers that organisational buying behaviour consists of three distinct aspects, namely, the psychological world of the individuals involved, the conditions which cause individuals to combine to make decisions, and the process of joint decision making. The main aspect of the psychology of the individual included in the model refers to the expectations about suppliers and brands, the term 'expectations' meaning the perceived potential which may be measured by obtaining a profile of the buyer's satisfaction with a supplier or brand. Individuals are likely to differ in their expectations and the model identifies five factors which create such differences. These are (a) the background of the individuals, (b) information sources, (c) active search, (d) perceptual distortion, and (e) satisfaction with past purchases. Whether or not a decision is a joint decision made by more than one person depends on factors relating to characteristics of the buyer company, as well as to characteristics of the individual involved.

Although Sheth presents a model of a systematic decision making process, he considers that there is 'ample empirical evidence in the literature to suggest that at least some of the industrial buying decisions are determined by ad hoc situational factors' (p55) which he describes as being other than rational. Sheth concludes that his model has six implications for industrial marketing research. First, research should be conducted into the psychology of individuals other than the purchasing agent because of the joint decision making nature of many purchasing decisions; second, it is possible to quantify most of the variables in his model (although he does not explain how this should be done); third, demographic and lifestyle information on the individuals involved is required; fourth, knowledge of the relative power positions of individuals involved in buying decisions is required; fifth, the way in which conflict is resolved between joint decision makers needs to be analysed; and sixth, the researcher should realise that a research approach which assumes a systematic decision making approach may not be appropriate in all circumstances.

3.6 Conceptual links between studies of organisational buying behaviour

In the previous chapter it proved possible to classify studies of freight modal choice at the level of the firm according to three basic approaches - the economic positivist, the technological positivist and the perceptual approaches. This section examines the approaches adopted in studies of organisational buying behaviour and assesses whether or not there are underlying similarities.

The method of review adopted in this chapter began by looking at a number of state-of-the-art reviews to determine the classificatory systems employed by other writers. It was found that most reviewers, although adopting different classificatory systems, proposed that there was a need for integrated models specific to organisational buying behaviour, rather than using models from other areas of knowledge which were able to present only a limited perspective and understanding of organisational buying behaviour. The chapter then examined a number of integrated models

which were conceptual in nature and unsupported by directly related empirical research. The approach adopted by those models shows an attempt to understand the complexity of the buying situation rather than to develop predictive models which aim to obtain satisfactory predictions with as few significant variables as possible. Webster and Wind (1972a) emphasise that 'complexity per se is not a virtue; the best model is always the simplest that permits a specified degree of predictive reliability and descriptive validity. Unfortunately, organisational buying behaviour is a complex process and single variable models are incapable of yielding the desired degree of validity and reliability' (p20).

A point to emerge from most of the studies in this chapter is that organisational buying behaviour is seen as a decision making process undertaken by one or more individuals in buying organisations. The idea of a process is common to many works. Webster (1965) describes a four-staged process of problem recognition, buying responsibility, search process and choice process. Robinson and Faris (1967) describe a process consisting of the eight stages or buyphases of anticipation or recognition of a problem, determination of the required product, description of the required product, search for sources, acquisition and analysis of proposals, evaluation of proposals and selection of suppliers, selection of an order routine, and performance feedback and evaluation. Webster and Wind (1972a and 1972b) employ the stages in the decision process described by Robinson and Faris. Sheth (1973) in his joint decision making process model describes the stages of the decision process as initiation of the decision to buy, gathering of information, evaluating alternative suppliers, and resolving conflict among the parties who must decide jointly.

A similar approach is found in a number of empirical studies. Ozanne and Churchill (1971) describe an industrial adoption process model with the five stages of awareness, interest, evaluation, trial, and adoption (or rejection). Luffman (1974a) presents a four-stage decision process consisting of the stimulus or reason for looking for a supplier, the search for alternative suppliers, the evaluation of information and the buyer's attitude to suppliers resulting in the purchase decision. Hillier's (1975) four-stage model consists of the precipitation of the purchase, the product specification, the selection of the appropriate supplier, and the commitment of the purchaser to the supplier subsequent to the purchase based on the degree of satisfaction. Thus, it can be seen that purchasing is described in terms of a human activity over a period of time rather than in terms of an instantaneous act or in terms of a transfer of goods or services for money based on the market. Furthermore, it is apparent that there are many similarities between the stages described by different writers, despite differences in emphasis or terminology. Indeed, one of the problems of organisational buyer behaviour as an area of study is the tendency of each researcher to develop his own terminology.

Another aspect common to most models is that the basic focus of research is the individual decision maker. Individuals as decision makers take a perceived risk (Newall 1977), assume responsibilities (eg Webster 1965, Hillier 1975), undertake search activity (eg Robinson and Faris 1967, Luffman 1974a and 1974b) and have attitudes towards suppliers (eg Luffman 1974a and 1974b, Bonoma and Johnston 1978). Although it

is assumed that such activities or perceptions are influenced by factors from the individual's environment, particularly from his organisation, the emphasis is on the individual, and 'the firm' does not undertake searches, have attitudes etc. Some writers draw parallels with the study of consumer buying behaviour in placing the individual at the forefront of studies of organisational buying behaviour; for example, Sheth (1976) states that 'despite the popular belief, there are strong similarities between organisational and household buying behaviour especially in regard to buyers' expectations, perceptions and mixture of rational versus emotional choice criteria' (p33). Webster and Wind (1972a) claim that 'models of consumer behaviour are likely to be incomplete as descriptions of organisational buying behaviour, because they leave out the influence of the formal organisation and some of the essential characteristics of the buying process. At the same time, they are valid descriptions of the buying decision processes followed by individuals within the context of the formal organisation' (p128). Although Webster and Wind stress the formal organisational aspect, it should be noted that their model focuses on buying decision at the level of the individual or group decision making unit, and that organisational factors are considered 'influences' which cause 'individual decision makers to act differently than they would if they were functioning alone or in a different organisation' (Webster and Wind 1972b p. 14). In other words, they propose that one should study the individual(s) rather than the formal organisation.

A number of studies suggest that a group perspective rather than an individual perspective should be adopted. Webster and Wind (1972a) describe the 'buying centre' consisting of 'members of the organisation who interact during the buying decision process' (p77), whereas Sheth (1973) writes of 'joint decision making', Ozanne and Churchill (1971) of the 'decision group', Luffman (1974a) of the 'decision making unit', Newall (1977) of the 'buying group', and Hillier (1975) of the 'decision unit'. If we examine the studies which are directly based on empirical field work (ie those of Hillier, Luffman, Newall and Ozanne and Churchill) we find, however, that the group is seldom considered as the unit of analysis in the way, for example, that the firm is often the unit of analysis in microeconomic theory. Luffman does not attempt to undertake a group analysis, but restricts his analysis to the responses of individual buyers. Hillier describes a decision passing through a number of states during which it is a group activity. However, his basic unit of analysis is the individual decision maker by identifying his role during each of the decision making states. Ozanne and Churchill (1971) consider that the group predominates as the basic unit in the empirical results of their industrial adoption process study with two or more persons participating in about eighty per cent of the adoptions. However, to obtain the characteristics of the decision group, the scores of individuals on explanatory variables were simply aggregated. Ozanne and Churchill admit the limitations of this procedure, stating that 'the group is more (or something else) than the sum of its parts, so how can each member's share be weighted in creating a composite characteristic? We used a somewhat arbitrary method of summing members' scores to arrive at the group measure' (p323). Such an approach does not take into account the relative influence of different group members. Newall (1977) derives a measure of 'locus of buying responsibility'. Although this measure is more complex than others described in the chapter taking

into account the relative influence of different group members, the group is still a composite of its existing individual members rather than a separate identity. For the group to be considered as a basic unit of analysis it requires an existence over and above that of its members. For example, the group structure describing the pattern of interpersonal relations rather than the group members might be used as the unit of analysis (see Davis 1969).

3.7 Freight transport and organisational buying behaviour

Freight transport is generally considered a 'service' industry; for example, Faulks (1973) states that transport 'is a service activity which usually stems from a derived demand' (p17). Therefore, at this stage it is appropriate to ask whether there is a fundamental difference in organisational buying behaviour when a service is involved rather than a product. Most organisational buying behaviour literature is concerned with the purchase of products, including all of the references mentioned in earlier sections. There have been a number of definitions of 'service', several of which have been reviewed by Wilson (1972). He proposes that the most suitable definition is that of the American Marketing Association which states that services are 'activities, benefits and satisfactions which are offered for sale or are provided in connection with the sale of goods' (American Marketing Association 1960 p21). Blois (1974) suggests that this definition is inadequate since benefits and satisfactions may also be associated with tangible products, and he proposes that a more suitable definition, based on that of the American Marketing Association, is 'a service is an activity offered for sale which yields benefits and satisfactions without leading to a physical change in the form of a good' (p137). Blois admits that his definition is not without its limitations; for example, is hairdressing a service? However, he considers that it is a definition in keeping with the generally understood nature of services. He explicitly includes transport under this definition.

Wilson (1972) suggests that services may be considered under the three headings of degree of durability, degree of tangibility and degree of commitment. Degree of durability refers to the extent of time over which benefits provided by a service would be incurred; thus, education has a high degree of durability. Degree of tangibility categorizes services in terms of those providing pure intangibles (eg entertainment), those adding value to a tangible (eg car insurance), and those that make available a tangible. Freight transport, therefore, is a service with a high degree of tangibility since it makes tangible products available at a particular location. Degree of commitment refers to the extent to which the purchaser is committed to a service over a period of time; so that, for example, a house mortgage requires a high degree of commitment. Blois (1974) suggests that there are three further classifications appropriate to services. These are the degree of essentiality, the degree to which one can postpone, and degree of cost. Blois attributes a somewhat different meaning to the concept of 'degree of essentiality' than Marrian (1965) who considers it to be the degree of economic importance of the product to the buying organisation. Blois interprets 'essentiality' in its widest sense rather than merely in terms of money value. For example, he states that third party car insurance cover is more essential than

full insurance cover since it is legally required. The 'degree of essentiality' referred to by Marrian appears to be equivalent to Blois' 'degree of cost'. The degree to which one can postpone refers to the extent to which the use of a service may be delayed, and it is difficult to see this as more than a particular application of the degree of essentiality (as defined by Blois). Other than the aspect of tangibility it is difficult to understand in which way any of these measures of services are specific to services and are not equally valid for material goods. Therefore, this section does not examine organisational buying behaviour related to freight transport from any specific 'service' standpoint.

At first glance there may appear to be little difference between the approach adopted in studies to be described in this section and those considered to adopt the perceptual approach to freight modal choice described in the previous chapter in section 2.5.3. The fundamental difference is that, although the unit of analysis in both cases is the individual (usually transport manager), the studies adopting the perceptual approach are concerned primarily with the perception or image of transport modes, whereas the studies described in this section are concerned with the individual buyer in the organisational setting. Of course, this is a distinction imposed on the works reviewed by the author and not consciously adopted by the authors of those works. Indeed, in one instance, two papers by the same authors (Cunningham and Kettlewood), derived from the same study, have been allocated to separate chapters.

Cook (1967) undertook a study of thirty-three firms in the West Midlands conurbation (the Black Country) between 1964 and 1966 interviewing persons responsible for transport decisions. His objective was to determine the transport requirements of firms, and in particular to discover reasons for the decline in rail usage. The study by Cook is particularly interesting since it took place before the recent growth in the study of organisational buying behaviour and approaches buyer behaviour from the perspective of the neo-classical economic theory of the firm.

Cook's main conclusions are,

'1. The decision making process did not confirm closely with what might be expected by a student of the classical theory of the firm.

2. The observed differences could only be partially explained. The historical development of the firm and the personal qualities of managers are significant factors in explaining these differences.

3. While transport costs are important, they are not always a decisive factor.

4. The variations in quality of transport service are more important to some firms than to others, and are not normally thought of in money terms. These differences are important, but there is not the infinite variety in transport requirements which is sometimes suggested.

5. There is an element of inertia which leads a business to continue with established practice until some new factor arises.

6. The transport department is, in general, considered of rather less

importance than the production, marketing and purchasing departments, and receives rather less attention. There is a feeling that profits are not made in the transport department, though they may be frittered away there. But the amount of attention paid to transport varies from firm to firm.

7. There is a wide variation in the ability of transport managers and persons responsible for running transport, and the calibre of the people involved does not always reflect the size, complexity and importance of the firm's transport problems' (p325).

The conclusions of Cook are written from the standpoint of the neo-classical economic theory of the firm , so that his approach is essentially task-orientated (using the terminology of Webster and Wind 1972a, see section 3.3). Cook identified, without investigating further, the impact of the individual transport manager's qualities on buying decisions, and the evidence of source loyalty which he describes as 'an element of inertia'. He also makes evident the need for an understanding of the extent of search activity when he states 'perhaps the most significant fact about these results was the lack of precision in the answers [about transport costs]. It was clear that transport managers were not very much aware of the importance of transport in the cost of the various products they were moving. Where they have an idea of transport cost, it was a general average which masked wide deviations' (p332).

Saleh and La Londe (1972) examined buyer behaviour in the selection of motor carriers (road hauliers) in the USA in terms of the buygrid analysis developed by Robinson and Faris (see section 3.5). Thus, a straight rebuy is defined as purchasing the services of a road haulier as a frequent and recurring activity where selection is based on a limited range of previously determined acceptable carriers. Modified rebuys occur when shippers desire to reduce transit times or transport costs as a result of changes in transport requirements (eg a customer changes his location), consistently poor performance by a carrier, and contact initiated by a competitive carrier. Saleh and La Londe do not include the new task type of buying situation in their research design. The research was based on personal interviews with forty-eight traffic managers combined with a validation sample of over four hundred respondents completing a postal questionnaire. The main hypothesis was that 'most shipper decisions on motor carrier selection exhibit a low degree of planning and deliberation throughout the entire decision making process' (p22), supplemented by a subsidiary hypothesis stating that 'motor transport service as a buying situation occupies a relatively low position in the shipper's hierarchy of traffic problems due to the lower level of risks involved in terms of product complexity and in terms of commercial uncertainty' (p23).

Results showed that road haulier selection decisions are on the whole made very quickly. Over fifty per cent of the respondents claimed to select the carrier 'instantaneously'. Whereas shippers rate highly the value of a search for alternative carriers (ninety-four per cent of the respondents agreeing that the traffic manager should look 'across the board' when selecting a carrier), behavioural data, in contrast to the attitudinal data, showed that only about twelve per cent of the respondents considered more than five alternative carriers in a market consisting of a large number of operating companies. The results suggest that caution should be exercised when seeking attitudes

in a setting such as work where there are strong normative pressures. Thus, an extensive search for carriers may be widely considered as good practice, but is it actually carried out? Saleh and La Londe conclude that there is little planning and deliberation by shippers when selecting road hauliers, that road transport is viewed as 'essentially a standardised and homogenous product' (p31), and that 'a renewable short-term commitment seems to be widely used' (p31). In the general area of business decisions the selection of road hauliers involves a low level of perceived risk and, therefore, 'it occupies a relatively low position among the shipper's hierachy of traffic decision making activities' (p31).

Although Saleh and La Londe have employed concepts from the area of organisational buying behaviour studies there is a limitation to their work which is not made explicit. Most major studies of organisational buying behaviour are careful to distinguish between the individual, the group and the employing organisation or firm. Although the survey of Saleh and La Londe was conducted with traffic managers, it is not clear to whom they are referring when they write of 'shippers', as, for example, when they claim that the selection of carriers will become more important with the growth of the acceptance of the systems concept applied to material flow (which has been described as the logistics concept in the previous chapter). In this case the 'shipper' appears to be equivalent to the firm rather than the traffic manager.

Cunningham and Kettlewood have published two papers (1975 and 1976) based on an unpublished thesis by Kettlewood (1971). The paper by Cunningham and Kettlewood (1975) has been reviewed in the previous chapter, and this chapter considers the paper published in 1976. An explanation for this approach has been given earlier in this section. The study is concerned primarily with source loyalty in the freight transport market, and they propose that 'in freight transport purchasing, two distinct types of loyalty can be identified: mode and source loyalty. Mode loyalty refers to the tendency to remain loyal to a particular mode of transport, whereas source loyalty relates to the particular transport supplier' (1976, p60).

It was hypothesised that source loyalty would be strong due to

'(1) the low pressure for cost savings due to the low essentiality of transport in terms of its contribution to the organisation's overall profitability;

(2) the allocation of transport buying authority to a member of the organisation as a secondary function;

(3) the desire to reduce personal risk due to the heavy involvement of others in the transport process;

(4) the desire of the buyer to reduce and simplify his work, by reducing the search for alternatives and delegating the short-term procurement of services;

(5) the influence of the consignee on the buyer's decisions, by specifying the mode of transport preferred;

(6) the availability of existing facilities whose use is confined to a particular mode and the need for investment in new facilities required for an alternative mode' (1976 p66).

The results of the research which was based on interviews with persons responsible for transport decisions in forty-three company establishments in Scotland found a high level of source loyalty. The average length of time for which both a principal operator and a particular mode on a specific route were maintained was about eleven years. The principal change of direction of mode was from rail to public road haulage. The degree of essentiality of freight transport was examined in terms of cost as a proportion of sales value, as the pressure for cost savings by organisational superiors, and as the information requirements of senior management. On average, costs were only 2.4 per cent of sales value, ranging from 1.5 per cent for engineering costs to 15.7 per cent for mining and quarrying products. Measure of the pressure for cost savings was based on the number of mentions by respondents of particular aspects, with seventy-five per cent of respondents mentioning the need to keep the consignee satisfied or to keep the warehouses clear of goods. Twenty-one per cent of respondents thought that cost minimisation without qualification was required. More than half of the respondents provide no information to their superiors on transport expenditure. Cunningham and Kettlewood conclude that the degree of essentiality of freight transport is low in terms of cost and pressure for cost savings but high in terms of quality of service. This state of affairs is likely to result in high source loyalty.

About three-quarters of the buyers were allocated transport buying authority on a part-time basis as a secondary responsibility. Four methods of reducing risk in terms of organisational uncertainty were identified. These were by establishing contracts with suppliers of transport, by having formal transport policies, by establishing a standard rate of charges with suppliers of transport, and by ownership of their own vehicles. Cunningham and Kettlewood (1976) suggest that a positive correlation was found to exist between the length of time for which the existing supplier has been used and the length of time since an alternative quotation had been sought. They claim that this tends to support the hypothesis that the buyer will seek to simplify his work through source loyalty. Cunningham and Kettlewood (1976) also suggest that consignee influence is strong in terms of specifying the mode of delivery, and that this is an influence on buyer behaviour which is unique to freight transport.

3.8 Summary

The previous chapter described how freight modal choice studies at the level of the firm may be classified, according to the underlying assumptions, into economic positivist, technological positivist and perceptual approaches. The current chapter describes the main approaches adopted in studies of organisational buying behaviour. They are concerned primarily with the decision making process behind the purchasing act and they place human values, particularly those of organisation members with buying responsibility, at the centre of the analysis. The chapter shows that the approach has been applied to the area of demand for freight transport.

It is difficult to maintain that there are limitations to the approach adopted in organisational buying behaviour studies since, if one accepts the integrative models such as that of Sheth (1973), the approach is wide-ranging. However, it could be argued that such an approach lacks focus and is extremely difficult to make operational for empirical purposes. It is difficult to accept organisational buying behaviour studies as contributions to a discipline, but rather as studies which use techniques from a range of disciplines directed at a common applied area. Nevertheless, patterns of study have emerged. In general, there is a tendency to identify a decision making process undertaken by a decision or buying centre. Studies tend to be organisation-centred . and concepts have been developed which are assumed applicable for all buying situations. At the risk of overgeneralisation, studies of buyer behaviour tend to underemphasise the nature of the product or service purchased, whereas studies of freight modal choice tend to underemphasise the nature of buyers (shippers). Furthermore, studies of buyer behaviour tend to be interested in the product or service (eg transport) as a purchase, whereas many studies of freight modal choice assume transport to be a stage in the production and distribution process.

A greater understanding of freight modal choice might be obtained through relating the technological behaviour of a transport system to the organisational behaviour of the shipper. This is not an original idea since it is implicit in many of the studies and explicit (although with different conclusions) in such diverse studies as those of Baumol and Vinod (1970) and Cunningham and Kettlewood (1975 and 1976), if the two papers of Cunningham and Kettlewood, based on the same unpublished thesis, are considered together.

However, there does not appear to be an approach grounded in theory which explicitly synthesises the behaviour of the transport system with the organisational behaviour of the shipper. The following two chapters attempt to develop such an approach.

CHAPTER 4. THEORETICAL DEVELOPMENT - ORGANISATION THEORY AND PERSONAL CONSTRUCT THEORY

4.1 Introduction

Chapter two described how there appeared to be three broad approaches to freight modal choice studies - the economic positivist approach, the technological positivist approach, and the perceptual approach. The current state of research would appear to indicate that the economic positivist approach has directed itself to logistics models which are basically prescriptive in their orientation. The technological positivist approach is based mainly on the measurement of modal use (as opposed to modal choice as a human activity) in terms of physical aspects of the transport system. It has proved successful up to a point in that it has identified markets for certain modes. However, a disadvantage of the approach is that it is unlikely to be able to take into account any potential for change. That is, it is concerned with current or past use and does not provide insights into future preferences of shippers, other than considering them as extrapolations of current use. The approach tends to take for granted that the technological variables associated with the transport operating system are related to the preferences of shippers.

Chapter three examined the contribution of studies of organisational buying behaviour to the subject area of this thesis. It was shown that the approach overcomes some of the limitations of freight modal choice models by allowing that the demand for freight transport is decided by people, and that a decision is likely to involve the interaction of a number of different people. However, although the study area of organisational buying behaviour takes intra-organisational behaviour into account, the focus of research is generally restricted to a single organisational goal (the buying act), whereas the selection of freight transport is not an isolated act but is intertwined with a number of objectives of the shipper company. Such objectives include the marketing of the products to be transported and inventory control. Furthermore, organisational buyer behaviour studies tend to be organisation-centred and to neglect the nature of the product or service being purchased.

Both freight modal choice studies and studies of organisational buying behaviour are concerned with organisational choice, since it is assumed that few shippers of goods act as individual consumers. A major area of theory which has considered choice or decision making in organisations is called organisation theory, and it is proposed that a suitable approach to freight modal choice may be developed through this theory which forms one of the two main parts of this chapter. The other main part of the chapter considers personal construct theory which has many similarities with the aspects of organisation theory presented in this chapter. The importance of the association of the two theories is that personal construct theory has developed a well-tried operational method in the repertory grid technique which will be described later.

The following chapter five will present a conceptual model, derived from the theoretical framework described in this chapter, and chapter seven will present an operational model based to a large extent on the techniques associated with personal construct theory.

4.2 Organisation Theory

Organisation theory is concerned with improving organisation efficiency and, therefore, is prescriptive in its approach. However, it has an 'open' approach to organisations in the sense that it is not concerned with the control of organisations through techniques, as, for example, operations research. The approach is concerned more with the social context within which firms operate than with depersonalised systems. Albrow (1973) suggests that 'from organisation theory, managers and administrators can expect both a widening of knowledge about how organisations work and a clarification of the concepts which guide their action. They are not handed ready-made solutions but rather the means to discover them' (p400). Albrow suggests that the style adopted in the application of organisation theory is diagnostic or clinical rather than exhortatory. Despite the distinction between organisation theory and the sociology of organisations, the former is essentially sociological in its concepts and will be presented within the sociological framework.

4.2.1 Organisation theory - a sociological perspective

It is possible to identify two major perspectives in sociology. They are the macro-level (or systems or structural-functionalist perspectives) and the micro-level (or social behaviourist or symbolic interactionist or social action perspectives). The macro-level is concerned with 'the institutional structure of society, the established patterns of behaviour, the relationships and interests which have become stabilised over time and which form distinct spheres of organisational patterning' (Parker et al 1977, p18). On the other hand, the micro-level is concerned with 'the way in which this world is patterned, the nature of choice and interaction, the shaping of meaning, group membership and role playing and the varieties of organisational involvement and experience of organisational constraint' (p18).

Silverman (1970) adopts a similar view of the major perspectives, stating, 'One perspective - Structural-Functionalist, Transcendental ... Holistic ..., or Systems - emphasised explanations of behaviour in terms of the interaction of systems attempting to satisfy their needs, and often made use of an organic analogy to explain the nature of the relationships between system parts. The other - namely Action, Immanent or Atomistic - argued that attention should first be paid to the orientations of the participants who might be differentially attached to any aspect of social life and who themselves create, sustain and change the rules of the social game' (p216). Similarly, Cotgrove (1967) states that 'two broad theoretical schools demand particular attention for an understanding of contemporary sociological perspectives - functionalism and social behaviourism. As we have seen, if we conceive of society as a system or structure, this leads rather naturally to the study of the functional relations between the parts and the whole. It is the body of theory which has grown up around this way of looking at society which has come to be known as functionalism' (p33). Cotgrove adds that 'the second important type of theory is social behaviourism. The distinctive mark of social behaviour is its emphasis on the study of the social individual - the social actor in the social system' (p35). Where Cotgrove differs from the other writers is to ascribe a behavioural interpretation to the latter perspective.

It will be indicated later that the essence of the social action approach (which is contrasted primarily with the systems approach throughout this chapter) is its concern with experience rather than behaviour. Behaviour infers that explanation is solely from the standpoint of the observer, usually the researcher, whereas experience requires that the explanation is in the terms of the behaving person. The section devoted to personal construct theory will consider the relation between experience and behaviour in the context of this thesis.

The macro-level of approach is most commonly manifested in the systems approach or in the structural-functionalist approach. In the systems approach it is assumed that the society or organisation has basic needs which require to be satisfied if the system is to survive. The system generally has goals, and the structure of the system has separate interacting functions which are called subsystems. By means of systems analysis it is possible to examine and explain the interrelationships between subsystems in terms of inputs and outputs. Actions or flows between the subsystems are generally perceived by theorists as undertaken by the subsystems which may be subject to a mechanistic form of self-monitoring by means of feedback loops. General Systems Theory which claims to be applicable to all types of system draws heavily from cybernetic, biological or organic analogies (see for example von Bertallanfy, 1972).

Structural-functionalism adopts a systemic approach to sociology so far as its theoretical perspective is based on examining the existence of societies (or organisations) in terms of their survival despite constant changes in members or personnel. A leading functionalist, Talcott Parsons (1970), portrays goal-attainment as the primary characteristic of an organisation, and he classifies the four main categories of mechanisms for the attainment of goals as 'the value system which defines and legitimises the goals of the organisation, the adaptive mechanisms which concern mobilisation of resources, the operative code concerned with the mechanisms of the direct process of goal implementation, and finally the integrative mechanisms' (p82). It can be seen that this approach is similar to the systems approach, although not all functionalists assume that a society or organisation has 'needs'. For example, Merton (1949) has introduced the concept of 'dysfunctions', referring to activities likely to destabilise an organisation, and 'latent functions', referring to the unintended or unrecognised consequences of an activity.

The systems and structural-functionalist approaches have been criticised for a number of reasons, primarily their assumption that a society or organisation may have 'needs'. Critics claim that to assume this is to apply an organic phenomenon to a social phenomenon, in other words to reify a non-living object (eg an organisation). Thus writers such as Merton (see previous paragraph) or Gouldner (1959) who have suggested that functionalist analysis could take into account the ends of different people, even when they differ or are contradictory, have been criticised (eg by Silverman 1970) on the grounds that if such an approach were adopted it would cease to be a functionalist theory. A similar criticism could be made of Elliott (1974) who, writing about

the systems approach, claims that 'most writers stress the social equilibrium ... is a managed and not a 'natural' equilibrium and that adaptive changes are usually the results of conscious decisions made by groups or individuals who happen to be in a position of power that enables them to make such decisions' (p94).

The social action approach covers a range of theories or approaches which Parker et al (1977) suggest may be grouped together 'under the 'symbolic interactionist' rubric, combining a rejection of behaviourism and positivism and a focus on the structure of meaning and the ways in which sociological constructions themselves are part of the universe of meaning' (p22). The justification for the social action approach is based on the fundamental difference between the social and the natural sciences. Whereas matter cannot understand its own behaviour and acquires no meaning (to the human understanding) until a frame of reference is placed upon it, human action is defined and understood by the actors themselves. In other words, 'social life, therefore, has an internal logic which must be understood by the sociologist; the natural scientist imposes an external logic on his data' (Silverman 1970, p127).

To state that people 'act' rather than 'behave' is to suggest that what they do has a purpose and their social life incorporates not only their behaviour but also the meanings which they attach to it. The interpretation of meaning distinguishes action from behaviour. Meanings are social in the sense that they are derived from interactions with other members of a society or organisation and from a shared language, which is not only cultural in the wider sense (eg the English language) but also in the organisational sense (eg job-specific 'jargon').

A number of criticisms have been made of the social action approach. For example, it is a technique for studying society rather than a theory about society, assuming that theory should be concerned with providing generalisable statements. The social action approach claims that the sociologist should seek to understand the subjective logic of social actors and situations, but it cannot, without contravening its own standpoint, make general statements about social action. Silverman (1970) suggests that an appropriate use of the social action approach is to apply it to research which is intended to generate theory. 'Substantive' theory based on a particular context would be derived, to be followed by a 'formal' theory based on a comparative analysis of a number of contexts.

4.2.2 Organisation theory described

There is a long tradition of prescriptive writing about organisations, often called 'management science' dating back to such authors as Münsterberg (1913) who attempted to devise a method for selecting the most suitable personality types for particular categories of work, and F.W. Taylor (1947) who developed a systematic approach to the measurement of work (eg time and motion studies). Albrow (1973) claims that organisation theory and the sociology of organisations both tend to take their stance at the point where management science studies based on improved control are subject to critical analysis, and they both

assume that organisational goals are not taken for granted a part of the researcher's terms of reference, but are themselves open to examination. Organisation theory is concerned with improving organisational efficiency and is, therefore, prescriptive. However, it does not follow the narrow prescriptions of the school of F W Taylor which is concerned with techniques, but instead it tends to see human values as central to its enquiry.

Simon (1965) has outlined the terms of reference of organisation theory as, 'a theory of human choice or decision making that aims to be sufficiently broad and realistic to accommodate both those rational aspects of choice that have been the principal concern of the economist, and those properties and limitations of the human decision making mechanisms that have attracted the attention of psychologists and practical decision makers' (p xi). The school of organisation theory which has been developed by Simon and others may therefore be seen as a reaction to the assumptions of 'classical' decision theory and its limited success in explaining human choice or decision making. Decision making is central to this school and, indeed, organisation theory is sometimes called decision making theory (eg March and Simon 1970).

Classical decision theory refers to the 'rational man' of economics or statistics who makes optimum choices within clearly defined constraints. The decision maker is presented with a range of 'given'alternatives to which are attached a set of consequences. The consequences may be faced either with certain ty, risk or uncertainty (March and Simon 1970). There is certainty where the decision maker has complete knowledge of the consequences, whereas risk exists where there is a known probability distribution of the consequences, and uncertainty occurs where the decision maker is unable to attach probabilities to consequences. It is assumed that the decision maker has a utility function which orders the consequences according to his preferences, and that he selects the alternatives according to the preferences. March and Simon (1970) claim that the assumptions of given choices, known consequences and complete utility ordering may not necessarily be criticised when they occur in a normative model. However, as a descriptive theory, they criticise the notion of an objective rationality, since 'we can only speak of rationality relative to a frame of reference' (p94) and where there is an observer (eg a researcher) we can 'speak of the rationality of the subject relative to the frame of reference of the observer'(p94). In an experimental situation not involving human beings as the subjects of the experiment, it may be sufficient to speak of the observer's perception of the situation as objective, but if, however, 'both subject and observer are men - and particularly if the situation is a natural one not constructed for experimental purposes by the observer - then it becomes difficult to specify the objective situation. It will be safest, in such situations, to speak of rationality only relative to some specified frame of reference.' (p94).

March and Simon present a theory of rational choice which has two basic precepts - '(1) Choice is always exercised with respect to a limited, approximate, simplified 'model' of the real situation. We call the chooser's model his 'definition of the situation'. (2) The elements of the definition of the situation are not 'given' - that is, we do not take these as data of our theory - but are themselves the outcome of psychological and sociological processes, including the chooser's own activities and the activities of others in his environment' (p94). March and Simon claim that human decision making is concerned with satisfactory standards rather than with the optimal standards of the classical theory. By 'optimal' they mean that criteria exist to compare all possible alternatives and a particular optimal alternative

is selected according to those criteria. On the other hand, an alternative is satisfactory where the selected alternative is adequate for the criteria describing 'minimally satisfactory alternatives'(p 95). In the classical theory the alternatives , from which the decision maker selects are presented as a 'given' set; however, in the decision making theory advocating decisions based upon satisfactory standards, alternatives are discovered sequentially through search activities by decision makers, the actions of the decision maker being adapted according to the results of such activities.

The approach of March and Simon has been developed by Cyert and March (1963) specifically in respect of the business firm in their behavioural theory of the firm. They suggest that a firm has a number of different goals undertaken by different organisational members (eg production, sales) and that the different goals place contraints on the activity of organisational members through the bargaining which different members must undertake with each other. They claim that 'goals arise in such a form because the firm is, in fact, a coalition of participants with disparate decisions, changing foci of attention, and limited ability to attend to all organisational problems simultaneously' (p43). In order that the different goals of the firm may be satisfactorily attained, Cyert and March suggest that there are four processes which are intended to maintain the stability of the organisation. These are 'quasi-resolution of conflict', 'uncertainty avoidance', 'problemistic search', and 'organisational learning'. Since organisations are unable to avoid conflict, being, according to Cyert and March, uneasy coalitions of participants, they attempt to control it through 'quasi-resolution of conflict'; that is by restricting the examination of the consequences of decisions through the delegation of a range of decision making authority to particular units of the organisation. Since the knowledge upon which decisions are made is strictly limited, the full implications of this limitation are avoided through restricting decision making to areas of activity where knowledge is greater. This is called 'uncertainty avoidance'. Owing to the cost and complication of the search for knowledge, such activity is restricted to situations where a specific problem occurs, and this is termed 'problemistic search'. 'Organisational learning' operates to overcome problems confronting the organisation by adapting the organisational functions, based on experience of similar problems.

It is clear that where decision makers attempt to 'satisfice' (Simon's word for obtaining a satisfactory performance - see Simon 1955), decision making involves search, analysis and evaluation. Such activities are generally presented as a decision process and although formulations may vary from one writer to another, a common form of the process is (1) search to discover goals; (2) formulation of objectives after search; (3) selection of alternatives to accomplish objectives; and (4) evaluation of outcomes (see, for example, Scott 1967, Archer 1964, Thompson 1965).

March and Simon (1970) have developed the concept of a 'performance programme' which describes the responses of organisational members to any organisational or environmental stimulus. They suggest that most organisational behaviour is governed by performance programmes and that there is a tendency for the activities of the decision making process to become routine to the extent that choice becomes simplified through the development of fixed responses to specific stimuli.

The concept of a decision making process has proved highly influential, for example, most of the studies in organisational buying behaviour described in the previous chapter have assumed the presence of such a process. However, some writers have cast doubt on the assumptions of organisational decision making which present outcomes (ie decisions) as the result of an identifiable sequence of events.

Lindblom (1959) suggests that the selection of goals and the sequential or developmental nature of decision making may not be an accurate description of organisational activity in some circumstances. He suggests that people make decisions according to 'successive limited comparison' where means and ends are not distinct, but, instead, ends are chosen which are appropriate to available means. According to Lindblom the search activity is so limited and the interrelationship between ends and means so close, that it may be inappropriate to assume a process based on an intentionally rational decision making approach.

In his more recent writings, March (eg March and Olsen 1976) has suggested that the concept of a decision is not obviously related to a process called decision making associated with the organisation. The traditional approach sees organisational choices (or outcomes) as the result of actions which make up the decision process. Decision making theorists tend to restrict organisational choice to the outcome of decision making procedures within the organisation. However, March and Olsen maintain that environmental actions should not merely be seen as responses to choices made within the organisation. They state that 'we need a theory of the environment which is less organisation centred, a theory where the actions and events in the environment sometimes may have little to do with what the organisation does' (p17). It is often overlooked that organisations are acting within constraints imposed by environmental factors rather than by factors within the organisation, and that the scope for behaviour by the organisation is often very restricted.

It is possible to consider the developments in organisation theory described in this section in terms of the main approaches to sociology described in section 2. The works of March and Simon (1970) and Cyert and March (1963) extend the decision making theory of the individual (eg Simon 1965) to the organisation which is portrayed as a decision making system. The organisation is a goal-seeking or purposive system attempting to maintain homeostasis through a series of internal adjustments. Cannon (1972) defines homeostatis as the steady states in complex living organisms which are maintained through a coordination of the physiological processes. He suggests that 'every complex organisation must have more or less effective self-righting adjustments in order to prevent a check on its functions or a rapid disintegration of its parts when it is subjected to stress' (p220). March and Simon (1970) suggest that stability is achieved through routine programmes and Cyert and March (1963) describe several 'self-righting adjustments' for the organisational system (eg uncertainty avoidance).

At the same time, the concept of subjective rationality suggests the social action approach since it is concerned with the definitions (or meanings) which organisational participants place on their activities. However, where followers of the social action approach would take issue with the concept of subjective rationality is that it is closely associated with the decision making process, and this is a considerable restriction on the range of potential 'definitions of the situation' by the organisational participants or social actors. March and Olsen (1976) suggest that the

rationales adopted by organisational members are not necessarily related to any theore tically conceived decision making system, and that organisational choice or outcomes need not necessarily be explained in systems terms. A 'pure' sociology of organisations approach may be interested in subjective definitions in themselves, whereas the approach adopted in the application of organisation theory is intentionally prescriptive, and should ultimately refer its attention to a more efficient system ('efficiency' in terms of the client of the researcher).

The approach adopted in this section has been to place organisation theory in a sociological context. However,there is already evidence that it is an area not restricted to concepts derived from sociology. For example, a major reason for the development of the area of organisational theory is a reaction to assumptions of the economic theory of the firm and it is therefore, highly dependent on economic concepts (particularly in relation to decision making), if only to reject or modify them. Concepts more appropriate to social psychology (eg beliefs, attitudes) are also evident in much of the writing. The link between the sociological approach and the social psychological perspective will be made in the second major part of this chapter when personal construct theory is introduced.

4.2.3 Organisation theory and freight transport modal choice

The two preceding chapters dealt with particular applied areas of decision making or choice (freight modal choice and organisational buying behaviour related to the purchase of freight transport). It was mentioned how they appear to have developed separately for different objectives. Freight modal choice has been developed as a research subject primarily to assist government in transport planning and is often one stage in a wider model of freight demand. On the other hand, organisational buying behaviour has been developed primarily as a research subject to assist commercial undertakings in the improvement of their marketing techniques. This section assesses the approaches adopted in the two applied areas of study in the light of organisation theory.

It was made clear in chapter two that many freight transport models assume unitary decision making in the firm in keeping with the neo-classical economic theory of the firm. It was shown that a number of models (eg Allen 1977, Baumol and Vinod 1970, Beuthe 1968) adopt this assumption,and there is no need to repeat the justifications for and criticisms of the approach, since a discussion of the nature of decision making models based on utility maximising has already been made.

The objective of Cyert and March (1963) was to develop a behavioural theory of the firm intended to overcome the limitations of the economic theory of the firm and, as described in chapter three, many of the studies into organisational buying behaviour are based on this particular approach. In fact, it is difficult to classify the entire body of work in the area of organisational buying behaviour under a few simple headings, not only because it is so abundant, but also because it tends often not to state its theoretical derivation or assumptions. However, the previous chapter indicated that when a closer examination is made of the integrated models of organisational buying behaviour and of empirical studies, it is found that there is a tendency to adopt an approach based on the assumption of a decision making process. Since organisational buying behaviour studies have been initiated principally to provide a contribution to improved

marketing, the studies are biased in terms of organisation theory in the direction of understanding the search activity undertaken by organisational members and the structure of the coalition of members responsible for buying (eg the buying centre).

Freight transport purchasing has been identified as a 'low priority' activity (Saleh and La Londe 1972) where decision makers display an 'element of inertia' (Cook 1967) or high 'source loyalty' (Cunningham and Kettlewood 1976). Although both Cook and Cunningham and Kettlewood conclude that the purchase of freight transport is a low priority and infrequent activity, other than as a 'straight rebuy', they arrive at quite different explanations. The difference in meaning between 'inertia' and 'loyalty' is evident in their writings. 'Inertia' suggests inefficiency on the part of transport managers, a theme developed by Cook when he writes of 'personal qualities' and a 'wide variation in the ability of transport managers and persons responsible for running transport' (p325). Cunningham and Kettlewood, on the other hand, see 'source loyalty' as a positive attribute (at least from the buyer's standpoint) to reduce personal risk and 'to simplify his work, by reducing the search for alternatives' (p66). Nevertheless, according to Cunningham and Kettlewood, buyers require a high quality of service, a further factor liable to reinforce source loyalty through avoiding uncertainty with new suppliers.

Saleh and La Londe (1972) see a low level of perceived risk as a given variable causing the selection of road hauliers to occupy a 'relatively low position among the shipper's hierarchy of traffic decision making activities' (p31). They conclude that 'this casual attitude toward the motor carrier selection decision is difficult to explain, considering the dollar magnitude of the purchase decision. For many companies, with the exception of purchased raw materials, the purchase of transportation service represents the largest dollar expenditure for outside vendor products or services' (p32). In contrast, Cunningham and Kettlewood conclude that 'the degree of essentiality of freight transport to most firms is low in terms of total expenditure and in terms of little pressure for cost savings. The quality of service is of such great importance that this would reinforce source loyalty to existing suppliers'(p74). Saleh and La Londe cannot understand why the perceived risk is so low for freight transport selection considering the high cost, whereas Cunningham and Kettlewood, on the contrary, conclude that it is possible to reduce the personal risk of the buyer since transport has a low cost relative to total costs. The difference in interpretation of the relative cost of transport may be attributable to contextual factors, since Cunningham and Kettlewood's study was undertaken in the United Kingdom, whereas Saleh and La Londe's research was in the United States. Both studies were undertaken before 1972, and therefore before the start of the rapid increases in oil prices in recent years which may have had an effect on relative costs. However, it is possible that the different assessments of freight costs result from the different starting points adopted by the researchers. Saleh and La Londe compare freight transport purchases with other items of expenditure, whereas Cunningham and Kettlewood compare the cost of freight transport with the sales value of the goods transported. Therefore they arrive at different interpretations of the importance of freight transport in cost terms. Such conclusions reflect the ambiguity of costs in commercial organisations, in contrast with the assumption of known costs made by some researchers writing in the economic positivist tradition (see chapter two). Company costs are often based on cost centres which may be somewhat arbitrary

agglomerations of activities parallel with the sometimes arbitrary location of some functions (particularly transport or shipping) within manufacturing organisations (this will be discussed in chapter six). This example illustrates how the economic positivist or logistics approach, often assumed by researchers to be how 'the firm' assesses freight transport, is merely one subjective rationality among several.

The objection by March and Olsen (1976) to the concept of a single decision making unit associated with a buying act appears relevant in this context. The relationship between the individual and the organisation is ambiguous. In what ways do organisations assess the importance of freight transport? The interpretations of Saleh and La Londe and of Cunningham and Kettlewood both appear reasonable and would provide different conclusions to be reached. Furthermore, can it be assumed that the importance of the activity to the organisation is likely to influence its importance to the individual transport manager? March and Olsen claim that goals need not be consistent between different organisational members nor between specific members (eg buyers of freight transport services) and the organisation as a body. Such inconsistency is implicit in the work of Cook when he writes of 'inertia' or in Saleh and La Londe's identification of the differences between attitudes towards searching for alternative carriers (the normative approach) and actual search activity reported (see chapter three). On the other hand, Cunningham and Kettlewood, following Cyert and March (1963), assume a systemic rationality where attributes of the individual and the firm coalesce to form a purposive orientation called 'source loyalty'. None of the three works consider conflicts or contradictions within the individual; for example, between professional affiliations and organisational membership, or between perceptions of status and perceptions of job content, although such a consideration is implicit since all authors mention the generally low status of people responsible for transport purchasing.

Studies in organisational buying behaviour tend to underemphasise environmental aspects, whereas the technological positivist approach to freight modal choice described in chapter two tends to ignore the human aspects of the organisation. By describing the interaction of the transport system with the product, it draws conclusions about the decisions (although not the decision making process) of the transport user. In the technological positivist approach a quite different interpretation is placed on decisions compared with that adopted in organisational buying behaviour studies. The shipment or consignment is frequently used as the basic unit of analysis and the modal choice is shown by the extent of use of transport services expressed in the number of consignments, tonnage etc. In such studies the more or less continuous activity in terms of consignment flows is normally considered more important to the researcher than the probably infrequent selection of a transport operator, since the purpose of the study is usually to forecast freight flows for planning purposes rather than to understand purchasing activity for commercial marketing purposes.

It might be assumed that some technological positivist studies employ classical decision making models; for example, Watson et al (1974) use logit analysis which relates the probability that a given mode will be chosen to the independent variables hypothesised to influence that choice. However, unlike the economic positivist approach, and in particular the logistics approach, there is not always the assumption

that variables known to a shipper are being used. Indeed Bayliss and Edwards (1970) specifically used variables which are measured objectively (ie by the researchers from documents) to avoid subjective distortion by organisational members. They have a separate, limited category of 'subjective assessments' which are estimates of performance by the shippers (eg speed required to meet customers' requirements). They doubt the existence of perfect knowledge assumed in classical decision making models, yet at the same time consider the limited knowledge of shippers an inadequate basis for decisions about modal choice.

The technological positivist approach has provided considerable insights into the nature of freight modal choice. It has shown that choice appears, to a large extent, to be technologically determined. Stenger and Cunningham (1976) write of a 'natural market' for either rail or road transport, and Morton (1972) discovered that only 60% of tonnage carried is competitive between modes in terms of mileage. It is conventional in the technological positivist approach to speak of the patterns of use of particular products or services in terms of 'modal choice'. However, the use of the word 'choice' suggests an element of consideration of alternatives by organisational members. It could be claimed that what most freight modal choice researchers have discovered in terms of explained choice has little to do with the choice or decision making of shippers, and that the explained activity is predominantly a factor of the interaction of the technology of the organisation with the technology of the environment. In keeping with the approach to organisation theory of March and Olsen (1976) there is no decision making process on the part of the shipper. Use of particular modes is taken for granted by the shipper as an environmental (or technological) constant.

However, technological positivist models often produce 'unexplained variance' which is attributed to the 'ideosyncracies' of the shipper. For example, Morton (1972) concludes that 'important determinants of modal split and intermodal competition remain obscured in the ideosyncratic needs of shippers and consignees' (p366).
This section has attempted to show that ideosyncracies are better considered as subjective rationalities. By considering the orientations or perceptions of specific organisational members expressed through the meanings which they attached to aspects of the transport system, and by examining the location of such members in the organisational system, it is considered that an understanding may be made of the relationship between organisational reality and its environment of the freight transport system.

Considerations of individual perceptions are in the province of psychology, and it is now an appropriate stage to examine the links between organisation theory and some of the approaches adopted in social psychology. This aspect is considered in the following section which introduces the approach for the empirical part of this work drawn from personal construct theory which is grounded in social psychology.

4.3 Personal Construct Theory

4.3.1 Introduction to social psychological perspective

The previous sections considered the suitability of organisation theory as an approach to understanding the relationship between organisational

members' experience of the transport system and the nature of freight modal choice. In particular they presented a framework within which the rationalities of social groups may be compared with prescriptive or normative approaches to freight modal choice. In keeping with the sociological level of analysis, it was assumed that it is possible to derive subjective meanings which are shared by members common to a social or organisational group (eg transport management). However, meanings or experiences or perceptions are ultimately the domain of the individual and the researcher will obtain an understanding of experience only through individuals. The degree of commonality of perception should indicate whether or not experiences are shared.

This part of the chapter explains why personal construct theory is considered a suitable vehicle for understanding the experience of individuals. It is a theory about the rationality of individuals or the way in which they make sense of the world. In this respect it is similar to those aspects of organisation theory described in the previous sections. It is a theory about a logical form of thought and is content-free in that it is not concerned with any particular features of the objective world, but, at the same time, may accommodate all phenomena, including the phenomena of freight modal choice.

The approach adopted in this chapter is to examine the nature of the social psychological perspective in general and then to place personal construct theory in this wider social psychological framework in order to provide an understanding of the type of theory it is. The basic tenets of personal construct theory are described, followed by a description of the associated repertory grid technique which is used to apply the principles of the theory. A particular feature of personal construct theory, unlike many theories, is that it has its own particular operational technique which is derived from the theory. The chapter concludes by linking personal construct theory and the repertory grid technique with organisation theory in the context of freight modal choice. This sets the stage for the conceptual model used in this thesis and described in detail in the following chapter.

4.3.2 A social psychological perspective

Social psychology has been defined as 'an attempt to understand how the thought, feeling or the behaviour of individuals are influenced by the actual, imagined or implied presence of others' (Allport 1968, p3) Lambert and Lambert (1964) state that social psychology 'is the experimental study of individuals in their social and cultural settings' (p1), and Hilgard and Atkinson (1967) state that it is 'that branch of psychology concerned especially with the problems that arise in the interactions among individuals: sensitivity to status, interpersonal relations of various kinds, attitudes and opinions and their change' (p573). Sekord and Backman (1964) place social psychology in the context of associated disciplines in the social sciences by stating that 'the social psychologist studies the behaviour of individuals in social contexts. Thus his business differs from that of the general psychologist, who often isolates the individual from his social environment; and it differs from that of the sociologist, who often studies the patterns of social interaction separately from the acting individual' (p1). Although these definitions may differ in emphasis, it can be seen that the emphasis of social psychology is on the individual in his social setting.

4.3.3 Personal construct theory described

Personal construct theory was presented by George Kelly in his work ' The Psychology of Personal Constructs' (1955). Other personal construct theorists who have extended the theory include Bannister and Mair (1968). However, personal construct theory is essentially the work of one man and is presented in a complete form in Kelly (1955). Personal construct theory is stated in abstract terms and is applicable to a wide range of circumstances, unlike much social psychological theory which is restricted to a particular aspect of psychological interest. Kelly has made clear the phil osophical assumptions underlying the theory contained in his concept of 'constructive alternativism'. He states (Kelly 1970) that,

'the events we face today are subject to as great a variety of constructions as our wits will enable us to contrive. This is not to say that one construction is as good as any other, nor is it to deny that at some infinite point in time human visions will behold reality out to the utmost reaches of existence. But it does remind us that all our present perceptions are open to question and reconsideration, and it does broadly suggest that even the most obvious occurrences of everyday life might appear utterly transformed if we were inventive enough to construe them differently.

'This philosophical position we have called constructive alternativism, and its implications keep cropping up in the psychology of personal constructs. It can be contrasted with the prevalent epistemological assumption of accumulative fragmentalism, which is that truth is collected piece by piece'. (p1 - 2).

Personal construct theory makes three basic assumptions about the world. Firstly, that 'it is real, it is not a figment of the imagination and man is gradually coming to understand it by making increasingly adequate interpretations of it' (Kelly 1955 p6). Knowledge of the world is achieved only through the interpretations placed on it and man attempts to improve his interpretations through successive approximations towards an accurate awareness of events. Bannister and Mair (1968) consider that personal construct theory may be contrasted with the 'groundlessness and subjectivity of the purely phenomenological or existential approaches' (p4) since it assumes that the world contains real events and it is concerned with man's attempts to understand such events. On the other hand, they suggest that it differs from psychological approaches which require 'the underpinning insurance which many psychologists seek in the supposedly more substantial events handled by the physiologist, neurologist or biochemist' (p5). This is because it accepts that man's thoughts and interpretations have equal validity with other events in the world. The second assumption is that the world is integral, meaning that individuals understand it by seeking relationships between events, including relationships where none have been previously recognised. The third basic assumption is that the world exists in time and that our present interpretations of it are subject to change which may be in the form of some far-reaching reconstruction rather than through the accumulation of elements of truth. This is the basic tenet underlying Kelly's concept of 'constructive alternativism'.

The relationship between man and the world is through personal constructs, a construct being defined as 'a bipolar concept, a way of categorizing similarities and differences which we perceive in our environment' (Bannister 1966, p363). Constructs are used when 'man looks at his world through transparent patterns or templates which he creates and then attempts to fit over the realities of which the world is composed. The fit is not always very good. Yet without such patterns the world appears to be such an undifferentiated homogeneity that man is unable to make sense out of it (Kelly 1955, p9). Fransella (1975) suggests that 'Kelly's model man is very similar to Kant's model man. Both see us looking at life through 'goggles'. Our view of the world is influenced by the already existing systems for organising the sensory experience. Our experience is either sifted through 'mental categories' (Kant) or personal constructs (Kelly). In both cases there is no hope for us to see the 'real' world, we see only our interpretations of it' (p30-31).

Kelly has described personal construct theory in the form of a fundamental postulate and eleven corollaries. The fundamental postulate is that 'a person's processes are psychologically channelized by the ways in which he anticipates events' (Kelly 1970 p9). This is a model of 'man the scientist' who attempts to 'make sense out of this world and to test the sense he has made in terms of his predictive capacity' (Bannister and Fransella 1971 p20). The first of the elaborative corollaries is the 'construction corollary' which states that 'a person anticipates events by construing their replications' (Kelly 1970 p11). This means that having experienced an event we are able to provide it with a construct which enables us to recognise the event or object when we encounter it again. The 'individuality corollary' states that 'persons differ from each other in their construction of events (Kelly 1970 p12). The 'organisation corollary' states that each person characteristically evolves, for his convenience in anticipating events, a construction system embracing orginal relationships between constructs' (Kelly 1970 p12). Constructs form an interrelated system which is hierarchical in nature so that some constructs are subordinate to others.

The 'dichotomy corollary' states that 'a person's construction system is composed of a finite number of dichotomous constructs' (Kelly 1970 p12). Kelly suggests that all constructs have two poles - a positive and a negative pole - both of which may be explicit (eg black versus white, hot versus cold), or one pole may be implicit when the contrast is not obvious. Whenever we make an assertion about an object or event we are implicitly stating that the assertion may be negated. For example, to state that a transport service is fast is to imply the possibility of a slow transport service (although this is only by way of illustration, personal construct theory does not assume that the opposite pole of a verbal label, such as 'fast', is necessarily the common semantic opposite since it depends on the individual's construct system).

The 'choice corollary' states that 'a person chooses for himself that alternative in a dichotomized construct through which he anticipates the greater possibility for the elaboration of his system' (Kelly 1970 p15). The individual elaborates his construct system either by obtaining a greater degree of differentiation for known aspects of experience, or by applying constructs to a wider range of experience. The 'range corollary' states that 'a construct is convenient for the anticipation of a finite range of events only' (Kelly 1970 p16). For each individual, a construct has a specific 'focus of convenience' and should not be considered as a general abstraction. A construct is specific to a particular individual (although there are obvious social influences which will

be mentioned later) and is based only on events or objects known to that individual.

The 'experience corollary' states that ' a person's construction system varies as he successively construes the replications of events' (Kelly 1970 p 16). One of the basic assumptions of personal construct theory is that the universe exists in time and, therefore, personal construct theory is a developmental theory. The pattern of inter-relationships between constructs and the nature of constructs for each individual change over time as the construct system is constantly put to test. The 'modulation corollary' states that 'the variation in a person's construction system is limited by the permeability of the constructs within whose range of convenience the variants lie' (Kelly 1970 p19). Permeability refers to the extent to which a construct is capable of including new objects or events within its range of experience. Thus, the construct good-bad is obviously highly permeable, whereas saloon-estate is restricted to motor cars and is relatively impermeable. Nevertheless they are both constructs (or, strictly speaking, potential constructs bearing in mind the individually corollary).

The 'fragmentation corollary' states that 'a person may successively employ a variety of construction subsystems which are inferentially incompatible with each other' (Kelly 1970 p20). The construct system is hierarchical and consists of a number of different subsystems, so that an individual may interpret events at levels which appear inconsistent depending on the particular subsystem of constructs applied. The 'commonality corollary' states that 'to the extent that one person employs a construction of experience which is similar to that employed by another, his processes are psychologically similar to those of the other person.' (Kelly 1970 p20). The notion of similarity, it should be stressed, is not that people are 'similar' because they are subjected to the same events, but that they are similar in that they attach similar meanings to their experience. The final corollary, the 'sociality corollary' states that 'to the extent that one person construes the construction processes of another, he may play a role in a social process involving the other person' (Kelly 1970 p22). This aspect of personal construct theory is intended to explain the interaction between people. Kelly employs a psychological, rather than a sociological, interpretation of role, claiming that people attempt to understand the construct system of those with whom they make contact, and behave accordingly. There is no suggestion that only people with similar construct systems interact or attempt to interact, simply that the interaction is based on the understanding (or misunderstanding) of each other participant's construct system. It is not based merely on an understanding of behaviour, unless this is the only level of understanding available, but on an attempt to understand the construction which the other person might be giving the first person's behaviour.

This section has described the basis of personal construct theory explained in the fundamental postulate and the eleven corollaries. It has been the briefest possible outline and has been restricted to defining the principle concepts. There are many aspects of the theory which, although relevant to clinical psychology, are not considered relevant to this work and have therefore been omitted. Nevertheless, such omissions do not undermine the essential nature of the theory. It is the aspect of the theory which considers how man interprets the world which is of particular interest to

the development of this thesis. It is central to personal construct theory that man is active in his attempts to interpret the world by means of constructs, that his construct system is capable of change, and that the theory is concerned as much with the content of the constructs and the objects generating them, as with the individual who is construing. In other words, it is a theory concerned as much with social perception as with the nature of the person. In this respect it would appear to provide a suitable theoretical basis for this thesis, since it is a theory about, at least in part, the interaction between man and the physical world.

Explanations or understanding of how phenomena are interrelated is explicit in personal construct theory which adopts, in the words of Shotter (1974) 'a personal approach' concerned with the way in which people coordinate their activity in terms of concepts. In conjunction with this approach the theory adopts an 'inside' perspective and
the level of analysis is at the level of the individual. That is, analysis is concerned with the interrelationships of constructs and elements for each individual to obtain the particular pattern or cognitive structure presumed unique to that individual. In this respect, personal construct theory differs from many other social psychological theories in adopting what Fransella and Bannister (1977) call an 'ideographic' approach rather than a 'nomothetic' approach. For example, the semantic differential approach of Osgood et al (1957) bears a superficial resemblance to the repertory grid technique of personal construct theory, requiring subjects to rate bipolar concepts from which a matrix of intercorrelations of concepts is formed. However, the concepts are always supplied by the researcher, and the results of all individual respondents are summed to obtain a general picture of average experience. Although factor analysis of the results of a large number of the results of a large number of studies have provided consistent descriptions of 'average man', Fransella (1965) found that when the semantic differential matrix was disaggregated to the level of the individual and the results of each individual were separately factor analysed, it was impossible to locate the dimensions of the 'average man' in most individuals. The notion of an 'average man' is not in keeping with the ethos of personal construct theory.

Slater (1977) doubts whether personal construct theory <u>as a theory</u> is testable since it is teleological rather than deterministic. Many psychological theoretical systems incorporate axioms based on the principle of causality, suggesting that every event has a cause. For example, differences in personality <u>cause</u> differences in conduct in trait psychology; stimuli <u>cause</u> responses in behaviourism. In contrast, personal construct theory suggests that people are purposive in directing their thoughts to the anticipation of events. It is difficult to envisage how this assumption which is fundamental to the theory may be tested. Slater proposes that, rather than consider personal construct theory as a general theory of man's psychological processes, it may prove of greater theoretical validity if restricted to the study of how people evaluate alternatives and reach decisions. In other words, the theory is restricted to those human mental activities which are, by definition, purposive. The nature of psychological theory is a major area of debate, often controversial, which could not be treated more than superficially here. However, even if one accepts Slater's restriction, it would appear that the approach described in this chapter is suitable for the subject matter of this thesis, since it concerns purposive choice activity (freight modal choice at the level of the individual in a social setting).

4.3.4 Repertory grids

Personal construct theory was developed to provide a theoretical basis for the application of techniques in clinical psychology, or as a contribution to a course of therapy. To this end Kelly developed the Role Construct Repertory Test (commonly known as the Rep test) which involves the elicitation of constructs from clinical patients. A number of techniques for the elicitation of constructs have been developed and Kelly (1955) originally described six such techniques., all of which are based on the triad method. In this method people are presented with three objects and are asked in which important way two of them are alike and at the same time different from the third object. In this way it is assumed that the characteristics of personal constructs (ie coexistant similarity and difference expressed in the bipolarity of the constructs) will be elicited from the clients. Other writers, for example Salmon (1976), have considered that the triad method is sometimes too complex for subjects, and other techniques have been developed, for example, simply comparing two objects at a time (Allison 1972), by eliciting superordinate constructs through examination of the preferred poles of constructs (called 'laddering', Hinkle 1965) and by eliciting subordinate constructs (called 'pyramiding', Landfield 1971).

Fransella and Bannister (1977) suggest that there is no point in being dogmatic about the method of elicitation provided that it successfully obtains the personal constructs of the subjects. Indeed, there is an extensive literature into the relative merits of elicited constructs and constructs supplied by the psychologist or researcher. In a review of the subject Fransella and Bannister (1977) suggest that where rating scales are used to assess constructs (rating scales are considered in detail in chapter seven), it is generally found that elicited constructs are more 'meaningful' than provided constructs in that elicited constructs have more extreme ratings. It is assumed that a greater degree of differentiation (expressed by the extremity of the ratings) is evidence of importance to the subject. However, they add that there is no firm evidence to suggest that provided constructs should not be used if they suit the requirements of the test.

The previous section referred to personal construct theory as being as much concerned with the world which is construed as with the construer. The area which is construed is represented in the Rep test by items called 'elements'. The nature of the elements will depend on the context of the test, although they were originally presented by Kelly as the role titles of people known to the subject (eg his father, his employer, his teacher etc.) in his Role Construct Repertory Test. Since then elements have been selected which cover many areas, and Fransella and Bannister (1977) provide a list of areas of study which includes elements describing occupations, feelings, diseases, rooms and photographs of people. There is obviously no limit to the potential content of elements. However, there are important factors to consider when selecting them. In keeping with the range corollary, the elements must fall within the range of convenience of the elicited constructs. Furthermore, if the researcher is to draw conclusions which go beyond the content of the test, it is necessary that the elements are representative of all elements within the range of convenience of the subject.

The previous section described how personal construct theory assumes that constructs are interrelated, and that there is a hierarchy of

constructs. The total construct system of the individual may be divided into interrelated subsystems. Although the Rep test is capable of eliciting constructs, it tells us nothing of the relationships between constructs, and, for this reason, the repertory grid has been developed. A grid is a matrix of n constructs and m elements in which there are nm assessments of elements in terms of constructs.

To accept that grids may be rated or ranked is to accept the concept of dimensionality when applied to constructs. It will be recalled that the dichotomy corollary suggests that constructs are bipolar (eg black versus white) and the concept of bipolarity without dimensionality (ie black-white without shades of grey) has been criticised by some writers (eg Slater 1977). However, it is clear that Kelly did not exclude a dimensional approach to the rating of constructs although he restricted his own Rep test to a dichotomous assessment. He states (1955) that 'from time to time we have used the notion of a construct as if it were an axis or dimension. Since we have assumed that constructs are essentially dichotomous, it may appear that we have ruled out the possibility of scales or continua involving more than two steps ..... Even though we envision the basic constructs out of which our systems are built as dichotomous, it is still possible to conceive of gradations .... along a dimensional line'(p141). Bannister and Fransella (1971) suggest that the 'shades of grey' are dependent on the construct black versus white.

Both rating and rank ordering scales have been widely applied. The advantage of rank ordering is that it allows the subject to assess each element against the other; however, as Slater (1977) states, 'Forcing the informant to distinguish between all the elements in terms of every construct may exaggerate differences between them and suppress similarities that might be of psychological interest' (p40). Thus, the results may provide an exaggerated picture of differentiation for some constructs. This section has restricted its discussion to some of the theoretical implications of different scaling techniques; in chapter seven the practical or experimental implications of the selection of the scaling technique and the implications specific to this thesis are considered in detail.

Stripped of its verbal labels a repertory grid is a matrix of numbers, and is therefore amenable to a wide range of statistical techniques. The analysis may be concerned with the structure or the content of the grids. Various structural measures have been devised which claim to measure such factors as cognitive differentiation, cognitive complexity and cognitive integration (Fransella and Bannister 1977). There is a considerable literature on this topic, but since this thesis is not concerned with the use of repertory grids to understand the cognitive processes of individuals, but rather to understand their understanding of a social situation, such topics are not considered at length.

4.3.5 Applications of repertory grid technique

Repertory grids have been used extensively for a number of purposes. Slater (1977) who was given a Medical Research Council grant to analyse grids for psychiatrists and clinical psychologists in the United Kingdom

states that he has processed thousands of grids. The use of the Rep test is widespread in marketing research, primarily to elicit the attributes of products (eg see Green and Tull 1978). Many marketing research exercises apply the repertory grid technique without attribution to personal construct theory. If we restrict consideration to studies which associate themselves with the theory, it is possible to distinguish between those studies which are concerned with the cognitive-structural aspects of the individual subject and those which are interested in how individuals represent the external reality. As mentioned earlier, this thesis is concerned with the latter approach and therefore further consideration is restricted to studies which are of this type.

Although a wide range of topics have been assessed using repertory grids, there do not appear to have been any studies in the area of modal choice either for freight or passenger travel. However, in recent years a number of studies have been undertaken in the area of environmental perception or the measurement of environmental images. Such studies bear some relation to the current work in that the current work should take spatial perception into account. Sarre (1973) and Harrison and Sarre (1975) undertook a study of the images which a sample of twenty women have of the City of Bath. The study used both elicited and supplied constructs and elements, and the analysis was based on a principal components analysis (this technique is considered in more detail in chapter twelve) where it was assumed that the principal components formed superordinate constructs. Two other studies concerned with environmental perception and using a similar technique were those of Harrison (1973) and Harrison and Sarre (1975) which examined the perceptions of forty-one independent shopkeepers of their retail environment, and or Riley and Palmer (1975) who examined the 'definiteness of image' of seaside resorts of a sample of sixty people.

All three studies relaxed the assumptions of personal construct theory by analysing consensus 'supergrids' by means of principal components analysis. A matrix is formed of the limited number of constructs (or elements) which are common to all respondents against the total number of elements (or constructs) obtained from all respondents. For example, Sarre derived a 'construct supergrid' which consisted of twenty-five elements common to all respondents against 334 constructs which were the sum of the personal constructs from all respondents. The objective of this form of analysis is to obtain a picture of each individual's contribution to the consensus than would be obtained if all grids were standardised by both construct and element. However, the approach can be criticised from the standpoint of personal construct theory since, although the relationship of each individual to the principal components is obtained, it could be claimed that the components do not 'belong' to any real person and are in themselves meaningless. Empirical research is often an inevitable compromise between theory and available analytical techniques, but it is possible that the environmental studies were too dependent on technique if the assumptions of personal construct theory are to be maintained. A full discussion of the technique is provided in Slater (1977).

A study in the associated area of planning by Stringer (1974a, 1974b and 1976) attempted to overcome the problem of aggregation of the results whilst at the same time retaining the individuality of the responses. The study was based on the repertory grids of nearly two hundred women who were asked to rank-order seven land-use planning maps incorporating

varying amounts of colour and base against elicited constructs. The objective was to examine the impact of cartographical variables upon people's responses to urban planning maps. Since the redevelopment area in question was known to the subjects, the real environment was also a significant factor in the understanding of the maps. Stringer obtained an overall picture through comparing structural measures derived from a principal components analysis of individual grids. Many measures were used, for example the percentage of total grid variance accounted for by each of the first three principal components. It was assumed that a relatively large third component indicates a greater degree of differentiation (ie a greater number of superordinate constructs). It was found that responses to coloured maps were more differentiated than to black and white ones in terms of the relative sizes of the principal components of the grids of individuals. Stringer was able to extract a considerable amount of information from the grid results in addition to that described here, and he considers that personal construct theory may prove a suitable approach to examine the construct systems of people at different levels of expertise in the planning process, including the planners. By doing this it may be possible to arrive at a greater understanding of the differences in opinion between different groups.

4.4 Personal construct theory, organisation theory and freight modal choice

Our level of knowledge is such that any approach of the social sciences can only be a partial approach and any theory can only provide a limited perspective. Heggie (1978), writing in the area of transport research, claims that much of consumer theory and the behavioural models which claim authority from it rely on intuitive assumptions which are unlikely to be supported by empirical evidence. He specifically refers to models of passenger travel choice in which he claims that assumptions unsubstantiated by empirical evidence include the notion of generalised cost and the differential value of in-vehicle travel time and walking and waiting time. Similar apparently unsupported assumptions may be found in the subject area of the writer's research. These include the assumption of unitary decision making of firms, and the assumption that the selection of a particular freight transport mode is based on a generalized cost functions applied equally to two available modes.

Where freight transport differs from passenger transport is that there is probably a greater normative influence owing to the hierarchical organisational context within which freight transport modal choice decisions are made. It is often assumed that such normative pressures will be based on economic assumptions directly related to transport so that some form of cost minimisation or profit maximisation in the context of modal choice is achieved. This is doubtless thecase in many instances, but there is no reason to automatically assume that the rationality behind freight modal choice is necessarily related to some overall cost function of the [illegible] organisation. . . Transport may be perceived as insignificant by senior management, or, in the language of organisational buying behaviour studies, it may have a 'low degree of essentiality'. Even if it is considered significant there is a variety of potential cost functions. For example, the logistics approach described in chapter two would arrive at a different cost solution that a more conventional departmental costing approach. Indeed, there is no single logistical function.

In the area of international freight transport, the total distribution approach, when comparing air transport with sea,has a different cost solution from an approach where only freight costs are taken into account (this will be discussed in chapter 13).

None of these approaches can be said to provide a 'correct' solution in any absolute sense, yet they may all be considered rational in that they are based on reason relative to a frame of reference. Similarly, the rationalities of individuals or social groups within the organisation may contribute to modal choice, and such rationalitites may not be related to any cost function which would be recognised by the dominant group in the organisation. For example, a transport manager may prefer the untroubled existence which results from using the same transport operator without considering whether or not the alternatives may be better. This 'inertia' which may be irrational from the standpoint of the economic positivist approach may be highly rational from the standpoint of the transport manager, and not necessarily in a manner which is to the detriment of his company as a profit making organisation. If the selection of the transport operator is a minor part of the transport manager's total work activity, it is possible that his limited time is better directed towards his other activities.

The rationalities which individuals or social groups form about their work, and about freight modal choice in particular, may be considered as implicit theories. This subject is discussed in detail in the following chapter. To derive such implicit theories of organisational members it is necessary to avoid imposing categorizations on them which are not related to the subjective meanings which they have of such objects as transport modes. The empirical problem exists in extracting subjective meanings. This problem is particularly difficult when applied to commercial organisations where there are considerable normative influences and where statements of opinion by leading figures are likely to be equated with organisational facts. The researcher working within the framework of organisation theory attempts to avoid such an assumption. Instead, he attempts to identify and reconcile rationalities and organisational facts. A necessary stage prior to reconciliation is an understanding of the implicit theories of all relevant groups undertaking any organisational activity.

It is possible that such an approach may be accomplished through the medium of personal construct theory. It is a theory which perceives people as 'theorists', interpreting their world in a rational manner. Through the 'commonality corollary' it is assumed that a 'theory' common to a group sharing similar experiences is possible. Furthermore, it has its own operational technique, the repertory grid test, in which the researcher provides the subject with a logical framework rather than preconceptions (ie provided attribute categories) as far as feasible. The framework of the repertory grid would appear to enable transport modes to be considered as elements and the attributes of modes as constructs. The 'cognitive structures' of shippers may be derived from the interrelationships of modes and their attributes. The bipolarity of the constructs in the repertory grids elicited from shippers may be compared with the bipolarity of other attributes of the transport system, including such technological measures as transit times. In this way it may be possible to provide a theoretically supported link between the technology of the transport system and the rationality of specific groups of decision makers in the shipper company. This approach is con-

sidered in detail in the following chapter which develops a conceptual model and in chapter seven which develops an operational model.

CHAPTER 5. DEVELOPING A CONCEPTUAL MODEL - A SOCIAL PERCEPTUAL APPROACH TO FREIGHT MODAL CHOICE

5.1 Introduction

Chapter two described how most freight modal choice models at the level of the firm treat the firm as a single unit. Chapter three described how studies of organisational buying behaviour, of which the purchase of freight transport is an example, attempt primarily to identify a decision making process, and therefore take into account the sequential participation of different groups within the organisation. In this respect such studies are likely to provide insights into modal choice which will not be evident in approaches which assume unitary decision making . On the other hand, many organisational buying behaviour studies offer only a partial perspective of buying activity by assuming the existence of a clearly identifiable decision making process and by ignoring the ambiguity of relationships within organisations or the variability of involvement of organisational members. This variability of involvement may be based on factors extraneous to the decision making process or even extraneous to the organisation. Therefore, such approaches tend to be not only organisation-centred, but also centred on a decision process which may possibly be nothing more than a construct of the researcher.

Researchers always attempt to impose a rationality on the situation being researched (a frequent imposition is the rationality of economic theory) and the work presented in this thesis is no exception. One of the tasks of theory is to explain events in a rational manner. However, in areas of applied research it is common for researchers to impose a rationality on the consciousness of the subjects of the research, and to assume that if they do not accord with such an imposed consciousness, they are therefore 'irrational'. For example, chapter two described how Baumol and Vinod (1970) contrast the choice of mode by a passenger with that by a shipper of goods. They consider that the modal choice of the passenger is ultimately a 'psychic matter of desires' whereas 'no pleasure is ordinarily derived from the means chosen for freight transportation' (p413). From this premise they make assumptions about which factors a shipper should take into account when selecting a freight transport mode. In fact, there is really no need for them to discuss 'pleasure' since their shipper is the unitary decision maker of 'the firm' of neo-classical economic theory. Their assumption is valid up to a point if it is assumed that the actions of individuals or groups are considerably constrained within organisations, but their approach overlooks the complexity of organisational life which has been described in other parts of this work.

In contrast, Gilmour (1976), in assuming that 'perceived product features' may be more likely to determine purchasing behaviour than 'actual performance characteristics' (p45), tends to underemphasise the complexity of organisational life, but from a different standpoint to that of Baumol and Vinod. Restricting his study to the perceptions of traffic managers, Gilmour concludes that the direct cost of transport is not an important determinant of freight modal choice, even when comparing such disparate modes as air and rail. It is surely more accurate to state that the direct cost of transport is not an important determinant of modal choice for the particular social group which participated in his research (tran-

sport managers). Possibly not because there is no difference in cost between modes, but because such an unlikely modal comparison would not enter their consciousness. In the language of personal construct theory, the two modes are not in the same 'range of convenience' from the standpoint of transport managers.

In contrast to the two above approaches, the technological positivist approach tends to remove the human factor from choice, and to assume that choice is based on the interrelationship between a number of technological variables. Technology is defined in this work as both the hardware and software of transport systems (see chapter two). In such instances there is no need to refer to the shipper of the goods, whether the shipper is considered as the firm, as a specific subgroup of the firm or as an individual in the firm. There is no need to use the shipper as the unit of analysis since it is assumed that if the appropriate technological variables are correctly identified, then all shippers will make the same choice in the same circumstances within identifiable probabilistic limits. Results which do not accord with the assumed relationship between technological variables may be considered 'ideosyncratic' (see Morton 1972). Since the shipper as a person, group or firm is not of primary importance in this approach, the basic unit of analysis is often the consignment. Some researchers in this tradition, unlike Baumol and Vinod or Gilmour, assume that the significant variables determining modal choice need not be known by the shipper. Thus, Bayliss and Edwards (1970) adopt an approach which attempts to minimise the influence of the subjectivity of the shipper on their model by restricting independent variables to those which they, the researchers, can measure directly without relying on reports from shippers.

The advantages and disadvantages of each approach have been described in detail elsewhere in this work. It would appear that an approach which examines modal choice as a human decision or intention but which is also directly related to the technology of the transport system would provide insights not otherwise obtained. In a sense, the economic positivist approach is an example of the proposed approach if one could assume that the firm as a unitary decision maker is a reasonably accurate portrayal of reality. However, studies of organisational buyer behaviour and the assumption of organisation theory suggest otherwise. An approach is required which identifies relevant socio-organisational groups and examines their relationship to the technology of the transport system. Such an approach may be categorised as a perceptual approach since it focuses on the transport system as perceived by a socio-organisational group. However, unlike the perceptual studies which were outlined in chapter two, it explicitly assumes that different groups within the shipper firm may have different perceptions of the transport system. As such it allows that there may be conflicts and contradictions between different socio-organisational groups in their perceptions of the transport system and therefore in their modal choice. Unlike other approaches to freight modal choice the basic unit of analysis is the social group. This approach does not appear to have been applied in freight studies before, although an awareness of the significance of social groups is shown in several of the studies described in this work (eg Cook 1967, Cunningham and Kettlewood 1976).

The model presented in this chapter is not intended to replace such approaches, but to describe a complementary approach which derives its

assumptions from personal construct theory and organisation theory. The similarities between aspects of these two theories were described in the previous chapter. The model is based on the assumption that organisational participants form implicit theories. This is in keeping with the premise of personal construct theory that man-the-scientist is constantly formulating, testing and reformulating theories about the world. Although personal construct theory is a personal rather than a social theory, it does not exclude the possibility of shared values as explained in the 'commonality corollary'.

Thus, one aspect of the social perceptual approach to freight modal choice is the assumption of similar implicit theories by social actors with similar experiences. Albrow (1974) states that 'any mention of the activity of professional groups, such as social workers or managers, must draw our attention to the fact that many occupations base their day to day activities on theory of some kind' (p41). Albrow adds that, although a manager may consider his 'professional knowledge' to be more 'practical' than the theories of social science, they are, nevertheless, theoretical formulations which are peculiar to a particular social group. In the words of Schon (1971), 'While the broad theory of the social system may be shared by everyone in it, there are likely to be variants held by people in different parts of the structure. The cop on the beat and the police commissioner have different views of the world and of the police force. Workers on the assembly line, foremen and managers of production all have world views different from one another and from the world view of the president of the firm' (p35). Stevens (1976) suggests the use of the word 'implicit' to describe such theories which are not usually formally stated or fully articulated, since this is not conventionally required unlike theories in the scientific tradition.

The more formal theories of science appear to have two common characteristics which are relevant to this discussion. Firstly, the theories are social in that paradigms are developed where people of similar backgrounds employ a common language and, through communication with each other or through similar experiences, hold a common body of knowledge. 'Paradigm' is used in the sense employed by Kuhn (1970) to describe the underlying assumptions of any scientific movement. There seems no reason to assume that this should not hold true for the 'theories' held by groups of people about their work. It is therefore possible to speak of the theories held by groups of people employed in similar work, rather than merely about the theories of individuals.

A second feature of the formal sciences is that where the theory is to be tested empirically, each theoretical perspective develops its own system of measurement which is considered appropriate for the science. Again, if we assume that each profession or work group has its own theories, then it appears reasonable to assume that such theories require measurements. Such measurements may not satisfy the rigorous requirements of the sciences, and they may be nothing more than crude approximations. However, even within a science the notion of measurement and testability may be controversial. Measurement is an assumed component of choice in the model developed in this chapter. Measurement may be seen as the means by which the social actors test their implicit theories, and such measurements are dependent upon a number of factors including the 'paradigm' within which the 'theorists' are working, the capacity of the measuring instruments, and the aspects of the object of study which are amenable or accessible to measurement.

This section has outlined the main assumptions behind the social perceptual approach to freight modal choice. The following sections present a conceptual model in a number of stages of increasing specificity.

5.2 Developing a social perceptual model of freight modal choice

The social perceptual approach to freight modal choice described in this chapter has three main components. First, there is the social aspect which decides the paradigm within which implicit theories about freight transport are made. Second, there is the technology of the freight transport system about which the implicit theories are made. The connection between the technology and the theories is through the capacity to measure the objects of the transport system against the assumptions of the theories (in a sense, the 'testability' of the implicit theories). Finally, there is the implicit theory itself which in this work is considered to be the basis of choice. Choice is a conclusion arrived at as a result of a theoretical stance. Choice is not considered to be what actually occurs (eg the freight flow in tonnes) since this is assumed to be not necessarily the choice of the social actor or social group. In any organisation it is possible that there will be more than one choice if more than one social actor or group is involved, and the outcome will probably be a compromise. Thus it is possible to have frustrated choice. The basic framework of the model is shown in figure 5.1

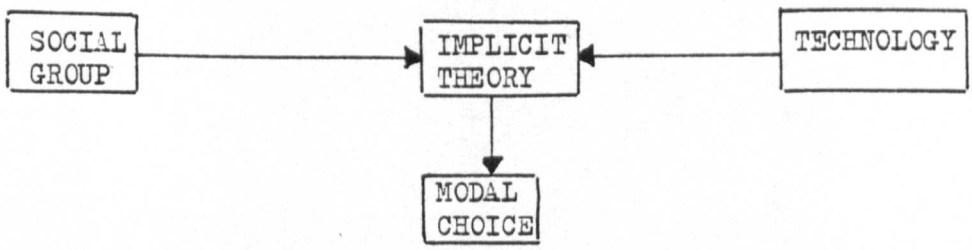

Figure 5.1 Basic framework of social perceptual model

The two ultimate influences on modal choice in terms of the model are therefore assumed to be the social group and the technology of the transport system. It is proposed to consider each of these aspects in turn, starting with the social group, and to relate them to the concept of an implicit theory.

In keeping with the assumptions of the social action approach (see chapter four) it is assumed that organisational members, or social actors,have shared values or shared implicit theories derived from similar roles within organisations. It is assumed that people undertaking similar tasks are likely to attach similar meanings to their activities. Just as the theoretical perspectives of chemists, physicists and biologists differ, although considering aspects of the same phenomena, so it is assumed that there are likely to be differences in theoretical perpectives of different groups within an organisation. The social groups are identified by the nature of their tasks or the

division of labour. In the context of the subject matter of the empirical work in this thesis such groups might include shipping managers, export marketing managers, and accounts managers among others.

It is assumed that members of different social groups within the organisation have different experiences of the modal choice activity. Furthermore, each group is assumed to hold a similar theoretical stance to other such groups in other organisations as a result of similarity of experiences, professional affiliations, shared technical or professional journals and shared contact with the same people (eg sales representatives). This is not to deny that there will be a common theoretical stance between different groups within a single organisation which differs from the common perspective of groups within another single organisation. To take an extreme example, there are likely to be common perspectives relating to the content of work of all members in a company exporting frozen fish which contrast sharply with the common perspectives of all members in a company exporting nuclear plant. However, it is assumed that there are common skills and judgements for a particular managerial subset (shipping management) which is widely identified as a separate social group (eg in job advertisements and in professional affiliation) and which, as a social group, may be discussed and analysed (this will be undertaken in the following chapter).

In keeping with the assumptions of personal construct theory, ultimately it is possible to identify an implicit theory which is personal to any given individual. It would be naive to assume that individual cognitions about work are determined solely by membership of the work group, but it is assumed that such membership has a considerable bearing on the nature of theorising or the judgement of work content, and that there will be an identifiable social content in any individual theory. Thus, the social group side of the model is extended to take account of different social groups within an organisation (see figure 5.2).

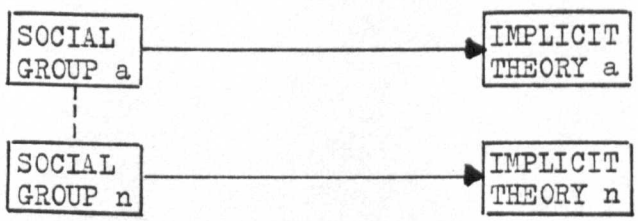

Figure 5.2 Social group side of model extended

The part of the model presented in figure 5.2 describes the organisation essentially in terms of division of labour without taking the relative power of different groups into consideration. However, most, if not all, business organisations are hierarchical, so that there is likely to be a division of power where one group may dominate or, at least, hold relatively more power than other groups.

There have been a number of studies of relative power in commercial organisations, and the results suggest that there is no general agreement among researchers on the symptoms of dominance. Therefore, one may assume that power, as a concept, is imprecise without a context,

and the results of the research will depend on the particular definition of power used by the searcher. For example, Perrow (1970) suggests that sales departments dominate in the American market-oriented economy. Hinings et al (1974), in contrast, found that the production department was more powerful than marketing, engineering or accounting departments in breweries and packaging manufacturers in the USA and Canada as a result of the skills and specialised knowledge required in production. In further contrast, Crozier (1964) found that in twenty tobacco manufacturing plants in France the dominant group was the maintenance personnel, sine the only serious problem which affected the factories was the breakdown of machinery.

It is necessary for the researcher to define his interpretation of power in a particular context. In any social situation there are likely to be several patterns of dominance. For example, in the context of this thesis, Davies and Gray (1980) found that shipping managers are less likely to select the mode of transport than to select the particular transport operator within a mode. In this instance, the group which selects the mode may be said to have greater relative power since, up to a point, the selection of the mode predetermines the selection of the operator. On the other hand, power may be defined in terms of the ability to influence ideas or to impose particular theoretical approaches on others. The views contained in NEDO (1977) advocating a through transport approach are not the only possible standpoints from which to make modal choice. However, they have been advocated by influential social groups and may therefore be considered dominant theories. In this work 'power' is considered to be the extent to which a social group is able to influence others in the acceptance of its theoretical standpoint. This form of development of implicit theories is assumed in the model presented here. The social group side of the model may now be shown as in figure 5.3.

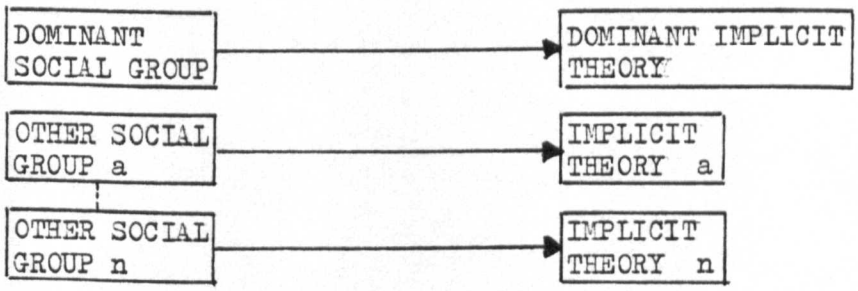

Figure 5.3 Social group side of model with dominant group

Up to this point the development of the model has been organisation-centred, but it has been claimed (eg March and Olsen 1976) that organisational activity is sometimes considerably constrained by environmental factors. The environmental factors specific to the technology of the transport system are reserved for discussion under the technology side of the model. However, there are environmental constraints or influences on the social group side of the model. The assumption that social groups are likely to have shared values has already been mentioned. In the case of the dominant social group, its shared values may be assumed to exert a normative influence on all relevant organisations. Thus, it might be assumed that the concept of the logistics approach confronts many large marketing organisations at the present time, whether or not they accept it. Such normative influences may be seen as prevailing theories which

enter the organisation through the dominant social group and which then influence the other groups within the organisation.

However, the normative influence is not the only influence on the organisation, and other social groups are expected to influence organisational activity through shared values resulting from such factors as professionalisation, shared experiences through journals and contacts, or mobility between organ ations (eg change of jobs). Thus, the complete set of influences on the social group side may be presented in the model as shown in figure 5.4. The direction of the arrows suggests that the groups within the organisation contribute to the normative influence or shared values as well as being influenced by them.

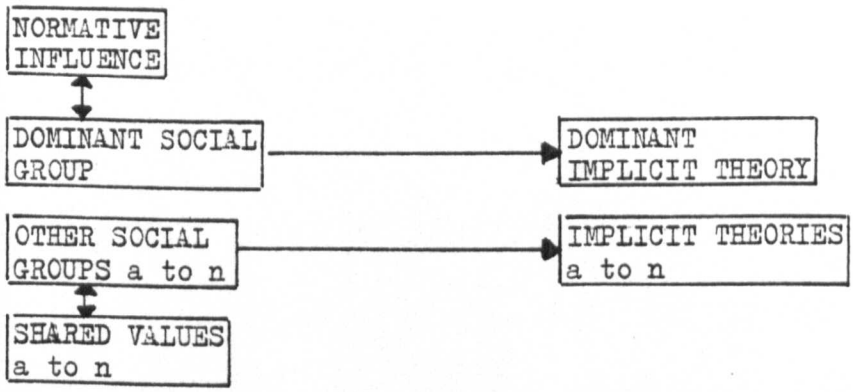

Figure 5.4 Influences on social group side of model

The other ultimate influence on modal choice is assumed to be the technology (the hardware and software) of the transport system, which consists of the phenomena about which the social groups' implicit theories are made. Given the implicit theory of the social group within the shipper firm, it is assumed that the group will extract a number of items from the general technological world of the freight transport system which have the potential for measurement so that the theory can be supported and, possibly, revised in the light of the evidence. This part of the model may be represented as shown in figure 5.5

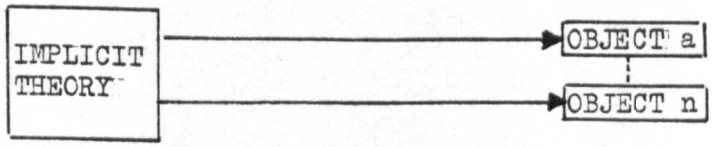

Figure 5.5 Technological side of model extended

The applied level of measurement depends on the discriminability of the measurer. Discriminability refers to the scale with which the social actor measures the objects in terms of his implicit theory. As a scale, it is assumed that it will have a level of precision and a range. For example, the level of precision of transit time in the implicit theory of a particular shipper may be, say, in terms of hours for transport within the United Kingdom, in terms of days for transport between the United Kingdom and Europe, and in terms of weeks for trans-

port between the United Kingdom and Australia. Furthermore, it may vary from mode to mode. The range refers to the acceptable (in terms of the implicit theory) limits of the scale of measurement. For example, a person skilled in obtaining freight transport services may not countenance a transit time which is longer than x days, so that all transit times x + 1 .... x + n are equally 'bad'. The extremes of the ranges, when converted into evaluations, may be seen as equivalent to the poles of personal constructs described in the previous chapter. A transit time which is 'satisfactory' according to the theory of one social group may, of course, be 'bad' according to another.

As mentioned in the introduction to this chapter, the concept of measurement is used in a somewhat 'loose' sense to include any method of scaling along a single dimension, and naturally lacks the precision of measurement applied to conventional scientific theories. Nevertheless, it seems reasonable to speak of measurement, assuming it to be the comparison of objects along a dimension based on a standard. The model may now be extended to take into account the discriminability, as shown in figure 5.6.

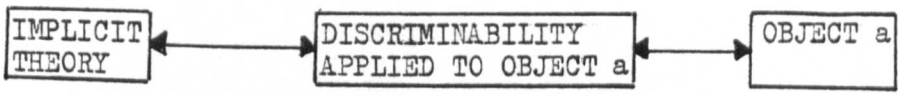

Figure 5.6 Discriminability applied to objects

The direction of the arrows is intended to show that not only does the implicit theory influence the nature of the discriminability, but also the latter is influenced by the nature of the objects in the technological system. For example, the nature of communications or information systems (ie the software of the technology) may influence the degree of precision with which transit times are measured. On the other hand, a very precise record of transit times may be of no use if the implicit theory cannot accommodate such data. The level of data (available facts) may not be equivalent to the level of information (facts of which some use is made).

5.3 The complete conceptual model

It is now possible to present a complete conceptual model as shown in figure 5.7. The model is intended to show that modal choice is the outcome of the implicit theories of a number of social groups within the organisation. These consist of the dominant social group and other social groups. For the sake of clarity, only two of the other social groups (social group a and social group n) are shown in the diagram. Modal choice is what members of the group want to do, rather than what actually happens. What actually happens may be called modal use which is shown as having a tenuous link with choice. The objects in the technology of the transport system about which implicit theories are made and tested are shown in the form of a Venn diagram to suggest that each social group considers objects which are exclusive to that group and objects which are common to more than one group. Furthermore, the Venn diagram suggests that there are objects in the transport system which are not taken into account by any social group but which have the potential for consideration.

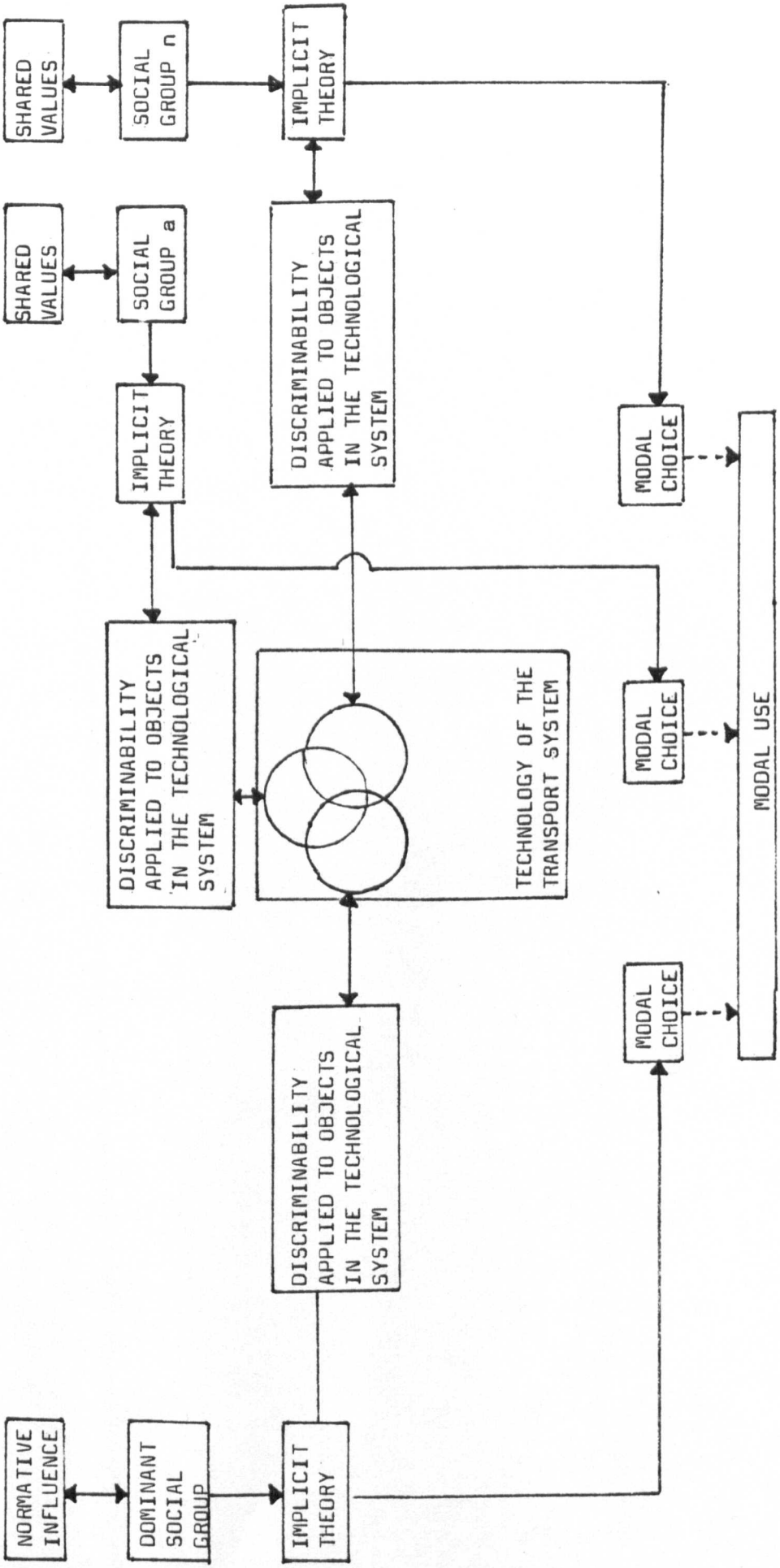

Figure 5.7 The complete conceptual model

5.4 Summary

The chapter has described a conceptual model of the social perceptual approach to freight modal choice. The model has three major components. It assumed that members of social groups within organisations form implicit theories about the technology of the transport system. Modal choice is assumed to be a conclusion arrived at as the result of a theoretical standpoint. The social aspect suggests that there may be more than one theoretical standpoint within an organisation and that the outcome of choice may be a compromise between the conflicting theories of different social groups of differing relative power. There is likely to be a dominant group within hierarchical organisations. The notion of a theory to interpret the physical world (a freight transport system) presupposes the capacity to measure the phenomena of the system. The nature of measurement (or the discriminability of the theorist) influences and is influenced by both the theory and the transport system.

The approach adopted here differs from other approaches to freight modal choice in that it disaggregates to the level of the socio-organisational group across organisations rather than to the consignment, the unit of weight, the firm or even the individual. It is assumed that there may be homogeneity in modal choice factors across a large number of firms if considered in terms of significant socio-organisational groups as a result of shared tasks and status. The similarities and differences between the implicit theories of different groups should assist in understanding the nature of modal choice and, thereby, modal use.

CHAPTER 6. DESCRIPTION OF THE TOPIC AREA

6.1 Introduction

The objective of this chapter is to introduce the reader to the background of the area of freight modal choice chosen for analysis in this work. The chapter begins by considering international freight transport in general as a functional system, and then in the context of marketing channels. It then examines two specific areas which are the focus for the empirical work associated with this thesis. First, the role of the shipping manager is described in order to identify the socio-organisational group whose modal choice is considered in this work. Second, the area of international freight movement about which the group of shipping managers will make their modal choice is described. This is the modal choice between air freight transport and less than full load surface freight transport from the United Kingdom to W. Europe.

Some of the data presented in this chapter is based on previous research by the author presented in an unpublished M.Sc. thesis (Gray 1977) or on research undertaken by the author in collaboration with G J Davies of Manchester Polytechnic. It is not intended that such results should be considered as original empirical work for this thesis, but as supporting data. The original empirical research undertaken for this thesis is presented in chapters seven to thirteen.

6.2 International freight transport as a functional system

Although international freight transport is a complex worldwide system it is possible to identify certain functions which are common to all movements between countries and for all modes, excluding bulk movements (eg oil tankers) and postal consignments which are not considered in this work. It is important to consider international freight transport in terms of functions rather than institutions since, as this section will show, the same types of institutions (eg freight forwarders) often undertake different functions in different circumstances.

International freight transport is shown as an interacting system in figure 6.1. Such factors as banking and import customs clearance are included since, although not directly considered as transport functions, they are important functions in the international movement of goods. For example, deadlines set by banks may influence the choice of transport mode owing to the complexities of payment of money between countries. A number of other functions could have been included and are likely to occur in an international freight transport system, but have been omitted as separate functions since they are not considered crucial to an understanding of the system. For example, the export customs function in the United Kingdom does not normally influence the movement of goods. Furthermore, a number of specialised institutions exist in international freight transport which are essentially part of the functions described in this section although they have a separate identity when described as institutions (eg ships' brokers). This comment, of course, applies only to a system viewed predominantly from the standpoint of the shipper.

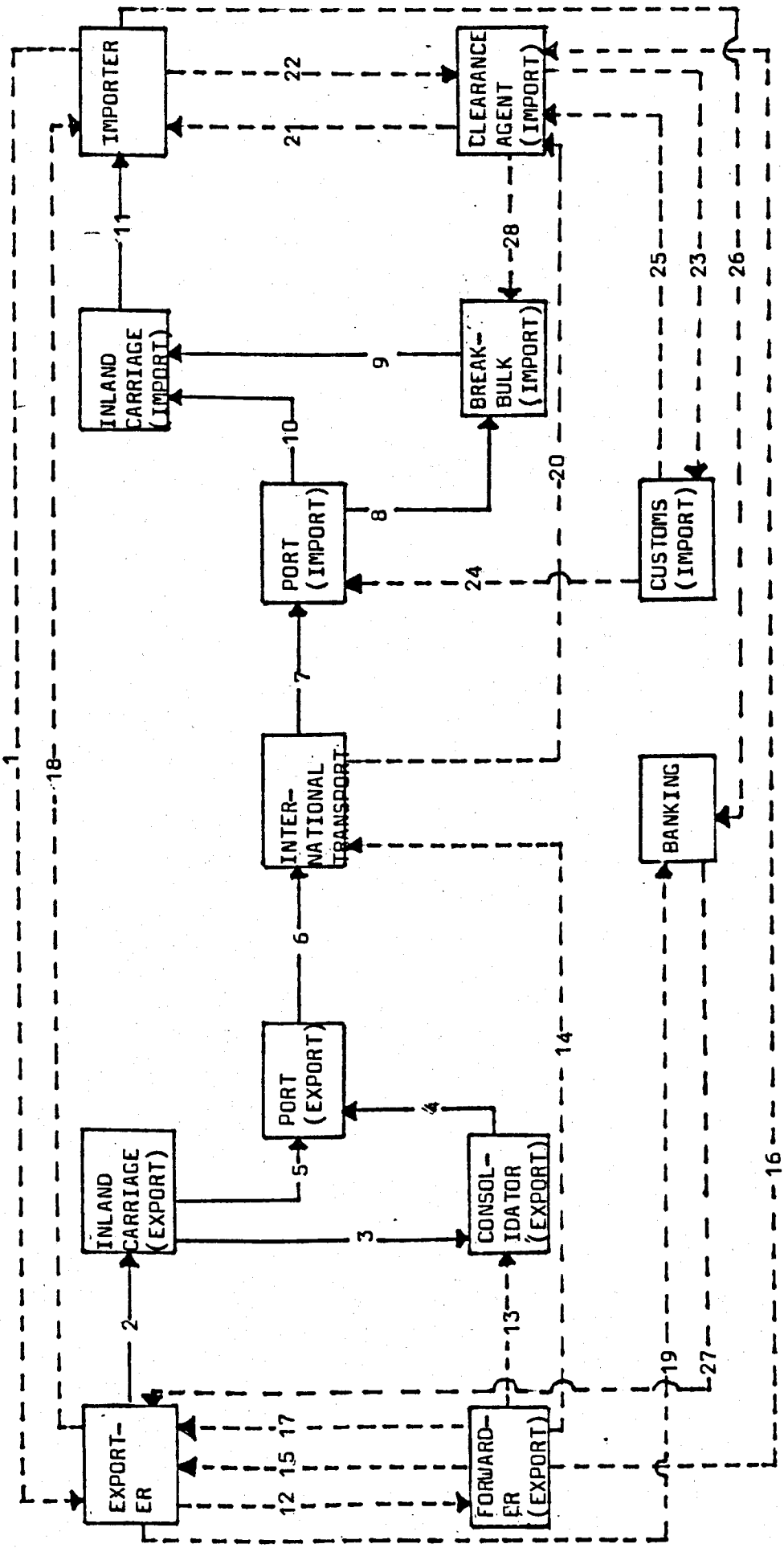

Figure 6.1 The international freight transport system as a set of functional subsystems
Code is given on following page 86
(Source Gray 1977)

ACTIVITY	FLOW REFERENCE	FROM	TO
Importer places order	1	Importer	Exporter
Physical movement of goods (without consolidation)	2-5-6-7-10-11	Exporter	Importer
Physical movement of goods (with consolidation)	2-3-4-6-7-8-9-11	Exporter	Importer
Instructions to arrange shipping	12	Exporter	Forwarder
Arrange shipping (eg book space)	13	Forwarder	Consolidator
"	14	Forwarder	International transport
Call forward consignment	15	Forwarder	Exporter
Notify despatch	16	Forwarder	Clearance agent
"	17	Forwarder	Exporter
"	18	Exporter	Importer
"	19	Exporter	Bank
Notify arrival	20	Intl. transport	Clearance agent
"	21	Clearance agent	Importer
Instructions to clear goods	22	Importer	Clearance agent
Submit customs entry	23	Clearance agent	Import customs
Customs inspection	24	Customs	Port authority
Release of goods	25	Customs	Clearance agent
Payment of order	26	Importer	Bank
Remittance to exporter	27	Bank	Exporter
Arrange final delivery via inland carriage	28	Clearance agent	Break-bulk agent

Figure 6.1 (cont) Code to diagram on page 85 (unbroken line = physical flows, broken line = flows of information, instructions etc)

The system described in figure 6.1 may be divided into four main subsystems which are:

a) the shipper subsystem
b) the physical flow subsystem
c) the forwarder subsystem
d) the import clearance subsystem

6.2.1 The shipper subsystem

The shipper subsystem consists of those functions whose prime interest in international transport is in the transaction of the goods carried. Therefore, this subsystem includes the exporter, the importer and the banking system. The term 'shipper' does not appear to be clearly defined. Sometimes it is applied to the sender or exporter of goods, and other times it refers to the payer of the international section of the freight charges who may be either the exporter or the importer. Furthermore, a distinction is seldom made between the shipper firm and the person(s) or department(s) responsible for the shipper function. This thesis is concerned with international freight transport from the perspective of the exporter and, to avoid confusion, the following three definitions will be applied.

a) the exporter: this refers to the exporting company as a firm, whether or not it is responsible for the payment of the freight.

b) the shipping manager: it is the assumed title of the person in the exporting company directly responsible for international physical distribution, whether or not his employer company pays the freight. The role of the shipping manager will be discussed in detail in section 6.4.

c) the shipper: this term is reserved for the organisation subsystem of exporter and importer combined. It will only be used where it is uncertain or irrelevant whether or not a particular decision or activity is undertaken by the exporter or importer. It is applied at the level of the firm.

6.2.2 The physical flow subsystem

This subsystem includes all those involved in the physical movement of the goods. Such movements are the inland feeder carriage in the exporting and importing countries, the consolidator and break bulk functions, the port function in the exporting and importing countries, and the international trunking function. Goods are either transported door to door direct in the same vehicle or container, or there is an intermediate consolidation stage. The direct door to door movement is often called 'full load' or, if containers are involved 'FCL' (full container load). Consolidation is the activity undertaken by freight forwarders or other transport companies which consists of obtaining a number of small consignments from different exporters and consolidating them into a single large consignment which may move internationally as a full load. Breaking bulk or deconsolidation is the reverse activity which occurs in the importing country. Consolidation is an essential skill of

international transport companies since it is one of the main reasons for which shippers employ professional carriers. The shipper benefits from the reduced rates obtained from sending his consignments as part of a full load, and the consolidator makes his profit from the difference between the low full load rate that he pays the international trunk carrier and the higher consolidated rate that he charges the shipper (the consolidator is in fact often the international trunk carrier as well). The term 'consolidation' is generally used for air transport, whereas the equivalent term 'groupage' is used for intra-European surface movements and the terms 'LFL' (less than full load) or LCL (less than container load) tend to be used for intercontinental surface movements.

6.2.3 The forwarder subsystem

This includes only the forwarder function shown in figure 6.1. Even the official publication of the Institute of Freight Forwarders (Gates 1978) finds difficulty in defining what is a freight forwarder. Gates states that 'a freight forwarder is a company involved in the international movement of goods on behalf of another company or person. It must be said immediately that the term freight forwarder is extremely difficult to define, meaning different or more specific things in various countries' (p3). He considers that the two main areas of freight forwarding are

'a) moving goods out of the country on behalf of exporters, or shippers; they are then sometimes referred to as Export Freight Agents.

b) bringing goods into the country, on behalf of importers; they are then sometimes referred to as Import Freight Agents' (p 3).

This work considers the freight forwarder function as an exporting country role (which is a traditional approach) and importing activities of freight forwarders are considered separately in the import clearance subsystem.

The following is an extract of the traditional export forwarder function from a more detailed description devised by the National Economic Development Office (NEDO) (1970).

a) preparing specialised shipping documentation
b) planning and costing the route
c) booking and coordinating transport
d) arranging ancillary services such as warehousing and packing
e) paying charges to transport operators, port authorities etc
f) advising on special trade and financial requirements of foreign countries and preparing special documentation,
g) providing exporters with information to prepare quotations

Surveys by the United Kingdom Committee for the Simplification of International Trade Procedures (SITPRO) (1970) and NEDO (1970) suggest that forwarders were still (circa 1970) principally employed as document preparers, to a lesser extent as transport providers and organisers, and to a still lesser extent as transport advisers. In recent years forwarders have become more prominent as consolidators and international carriers, so that of 140 groupage (ie consolidation) services listed by

Maclean Hunter (1977), 66% were trading members of the Institute of Freight Forwarders, as were 31% of 212 road haulage services to mainly European destinations. It should be emphasised that there is no obligation on freight forwarders to be members of the Institute of Freight Forwarders, although most leading forwarders are members.

The encroachment of freight forwarders on the physical flow function has been matched by similar cross-functional activity by shippers and forwarders. Davies (1981) has identified three types of relationship between the exporter and the forwarder. In the 'traditional approach' the exporter employs one or more forwarders to carry out most of the functions described in the NEDO (1970) report above. However, Davies has identified two types of vertical integration which deviate from the traditional approach. The 'forward integrated exporter' has adopted all or some of the traditional forwarder's functions, particularly in the areas of documentation preparation, in dealing directly with carriers for consolidation, and export packing. Another development identified by Davies is the 'reverse integrated exporter'. In such instances freight forwarders undertake the export distribution functions normally performed by the shipping department in the exporting company (to be discussed in section 6.4). In this approach the forwarder, although a separate institution, becomes functionally part of the exporting company. Davies considers that few forwarders have recognised the potential for this approach.

6.2.4 Import clearance subsystem

This subsystem includes the functions of clearance agent and customs in the importing country. The clearance agent prepares the appropriate documentation to clear goods through customs on importation, and often arranges inland carriage in the importing country. A number of types of institution may undertake the import clearance function, and in many countries, although not the United Kingdom, there is a statutory limitation on the type of institution. In the United Kingdom the most common type of institution undertaking import clearance is the freight forwarder. The import clearance agent is also sometimes called the customs agent or, in certain overseas countries where there is a statutory restriction, the official customs broker.

The customs function, being a statutory function, can only be performed by the customs authorities. Different countries have traditionally performed different customs practices, although there is a modern tendancy to adopt a standard code of practice. For example, at the International Convention on the Simplification and Harmonization of Customs Procedures in Kyoto in 1973 (Customs Cooperation Council 1975) a code of international standards in clearance practice for customs authorities was instituted.

6.2.5 The institutional framework of the international freight transport system

In contrast to the functional system it would be very difficult to describe adequately the institutional framework for the entire international freight transport system with any degree of brevity, and this section seeks merely to identify general institutional patterns which may be related to the functional system.

From the United Kingdom perspective it is possible to divide international freight transport into three broad areas:

a) air
b) deep sea
c) short sea

The predominant structure of the air and deep-sea freight transport industries is oligopolistic as far as the international carriers are concerned. Both systems tend to be dominated by cartels which set mutually acceptable prices and agree schedules of operation.

The cartel for air transport is the International Air Transport Association (IATA), an association of the world's schedule airline operators. IATA should not merely be considered as a price fixing cartel since it is involved in many other roles including the promotion of safety in the air and the improvement of telecommuniction systems. However, discussion in this section is restricted to the market role of IATA. In common with many areas of freight transport it is easy to find arguments for and against price controls in the literature. For example, Tapner (1967) states of the IATA rate-fixing conference,'the individualty of each airline has been preserved, normal healthy competition has been retained, rates have been kept at an economic level, and a cut-throat rates war has been avoided'. In more recent times it is possible that commentators have become more critical of IATA. Gennaro (1976) says, 'no other industry subjects itself to so many unenforceable regulations: no other industry is protected by so many monopolistic privileges.'

Recent developments such as split charter operations (the consolidation of the consignments of different shippers in a chartered aircraft by a freight forwarder or charter agent) and the moves towards deregulation of air freight rates at the insistence of the United States government's Civil Aviation Board have weakened IATA. According to Woodhatch (1980) it is possible that IATA may be 'outlawed' altogether in about two years.

Airlines have tended to restrict their operations to the actual air mode and have shown little interest in controlling the land movements which are required in most cases both before and after the international transport stage. This is probably because freight has traditionally played a secondary role to passenger transport for airlines. Furthermore, the airfreight industry is highly regulated and freight forwarders are required to be accredited by IATA as having satisfied certain standards such as suitability of premises and staffing before they can handle traffic on behalf of IATA member airlines. Such a high degree of regulation has probably restricted the development of non-traditional functional activities by institutions in the physical flow and forwarder subsystems. Interestingly, at the time of writing, a radical development away from this pattern has been reported by Hering in 'International Freighting Weekly' (10.9.80) and relates directly to the area of modal choice considered in this thesis. According to Hering, British Airways and a number of other European airlines intend to launch a new door to door service for cargo shipments between the United Kingdom and various W. European countries. He states that 'the operation aims to compete with TIR operators, whose increasingly aggressive marketing techniques have caused a good deal of concern to the carriers for some time and which have been attracting increasing volumes of traffic away from the

airlines. It will mark the first occasion when a group of airlines has combined resources to provide shippers with a door to door package at an inclusive rate which, British Airways say, will be competitive with current European door to door surface operators' (p3).

Deep sea freight transport refers to the movement by sea to countries outside Europe. It is predominantly controlled by a number of geographically based cartels called conferences (eg East Africa Conference, UK-Australia Conference) which are associations of liner operators who agree to run regular scheduled services and charge a common tariff for the same route. On most routes it is possible to find shipping lines which are 'outsiders' or non-conference lines offering lower rates. To counteract this, conferences generally offer rebates to customers who commit all their traffic to them. Unlike air transport, deep-sea surface transport has shown a strong tendency for institutions to adopt non-traditional functions. For example, it is common for the liner company to undertake the inland carriage and consolidator/break bulk functions where intermodal devices, usually containers, are operated. This is mainly on routes between two industrially developed or high income countries. For example, the two main consortia of liner companies operating between Britain and Australia, Overseas Containers Ltd (OCL) and Associated Container Transportation Ltd (ACT) offer a door to door service, sometimes called an integrated service.

Short sea routes refer to surface sea movements between the United Kingdom and Europe. Sometimes a distinction is made between 'near sea' (eg UK to France) and the longer 'short sea' (eg UK to Sweden. Such a distinction is not important at the level of description presented here. The short sea routes generally have two basic methods of transporting general cargo: by roll-on/roll-off trailer ferry (ro-ro) and by lift-on/lift-off container ferries (lo-lo), although conventional services (the traditional method of stowing cargo 'loose' in ships' holds) still exist. The ro-ro ship operators appear to show little interest in developing integrated door to door services and a large number of international freight forwarders and road hauliers operate their own vehicles, using the shipping lines as ferries. Where a shipping line such as P & O Ferries, operating between Britain and Europe, is part of the same group of companies as one of the largest international road hauliers (Ferrymasters), they appear to operate as independent companies rather than operating a fully integrated service. However, the lo-lo service by Bell Lines is an exceptional example of a fully integrated service under one firm. The short sea market is highly competitive with a considerable number of independent freight forwarders and road hauliers. Further discussion of this area is reserved for the discussion of the modal choice topic area in section 6.6.

6.3 International freight transport in the context of marketing channels

Stern and El-Ansary (1977) have defined a marketing channel as

' an interorganisational system made up of a set of interdependent institutions and agencies involved with the task of moving things of value (ideas, products, services)) from points of conception, extraction or production to points of consumption. Its primary focus is on availability - delivering valuable objects to points at which they may be

easily examined, evaluated and consumed. Marketing channels should be considered as the relevant units of competition; the viability of any given organisation depends greatly on how well it interacts and co-ordinates its efforts with other organisations which purvey its ideas, products or services' (p23).

Mallen (1977) comments at length on the range of definitions of marketing channels, but considers that the widest definition would encompass,

' 1. Activities dealing with the transfer and negotiation of ownership.
2. Activities dealing with the physical movement and storage of products.
3. A range of auxilliary activities, eg communications, financing, risk taking etc.' (p33).

This work is concerned primarily with transport and, therefore, with the impact of marketing channels on the physical movement of goods insofar as it is associated with transport. In fact, transport or even physical distribution appears to receive scant attention in some studies of marketing channels; for example, Mallen (1977) explicitly excludes the selection of and relations with transport operators from his book on the principles of marketing channel management.

This work is not intended as a contribution to the study of marketing channels, but adopts the concept of a channel for studying freight modal choice. Chapter two has mentioned the tendency of some studies of freight modal choice to rely on technological measurements and to overlook the behaviour and organisational aspects upon which much emphasis is placed in the study of marketing channels.

Channels are concerned with relationships between organisations, and this section looks at two sets of relationships:

1) The trading channel, or the relationships between the supplier and the customer.

2) The transport channel, or the relationships between the shipper and the transport industry.

6.3.1 The trading channel

Trading channels are concerned primarily with the activities dealing with the transfer and negotiation of ownership, and, in international freight transport, the transfer of ownership of the goods being transported may reasonably be associated with the transfer of responsibility for organising freight transport. Transfer of ownership and responsibility for the goods is indicated in international trade by the terms of sale. The terms of sale are used to define the contract clauses in international trade so that the rights and obligations of each party under the sales contract are clearly established. For many years the International Chamber of Commerce has advocated the use of standardised terms of sale called INCOTERMS, and they are widely, although not universally used. There are 11 recommended INCOTERMS, but they may be reduced to four basic sets of channel relationships for the purposes of this study. The relationships are:

1) Ex works: where the consignee is responsible for the transport for the entire journey from the supplier's premises.

2) f.o.b (free on board): where the supplier is responsible for the transport of goods to the port, airport or transport depot in his country and the consignee is responsible for the international movement and the final delivery of the goods in his country.

3) c.i.f (cost, insurance, freight): where the supplier is responsible for the delivery of the goods in his country and the international movement of the goods as far as a port, airport or transport depot in the consignee's country, and the consignee is responsible for the final delivery of the goods to his premises.

4) Delivered domicile: where the supplier is responsible for the entire movement of the goods.

Thus, it is possible to relate the terms of sale to three stages in the total transport (see figure 6.2).

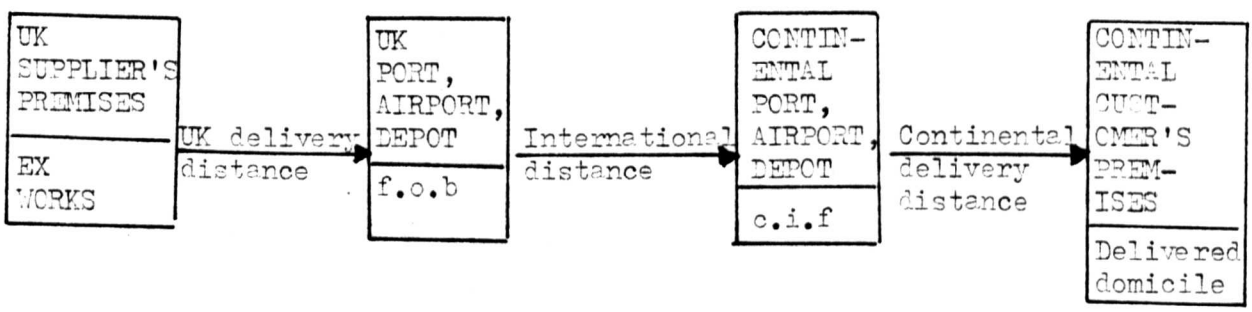

Figure 6.2 Terms of Sale related to Physical Movement

There are two noteworthy patterns in the terms of sale which may influence modal choice. The choice between surface and air transport is essentially a choice between the modes used for the international movement. In the simplest form of relationship between the supplier and consignee this choice would be made by the supplier if the terms of sale were c.i.f or delivered domicile, or by the consignee if they were ex works or f.o.b. Thus, one trading channel contrast which may be associated with transport choice is:

1) Ex works and f.o.b versus c.i.f and delivered domicile, which may be called the territorial contrast since it is dependent on geographical location.

On the other hand, an alternative relationship is that described by the National Economic Development Office (NEDO) in its report on trading with Europe (NEDO 1977) where the use of the 'total export concept' to boost Britain's export performance is advocated. The total export concept is based on an approach where a firm integrates aspects of production, marketing, distribution and customer servicing, and is therefore concerned with topics beyond the scope of this work. However, an aspect of the total export concept which is relevant is the 'through transport approach' where either the buyer or seller is responsible for the entire transport, thus allegedly avoiding a disjointed delivery service. NEDO says,

'too many UK traders are still inclined to regard transport as a number of separate and independent road, rail, shipping, air, port and inland clearance services leaving agents or forwarders to link these together' (p19)

The NEDO report perceives this approach as a deterrent to improved export performance, since it is assumed to offer a lower level of customer service to foreign importers.

Thus, another channel contrast is that of the through transport versus the nodular transport approach. This contrast is, of course, from the perspective of the shipper in his relationship with the transport world, and does not imply that the different approaches necessarily result in any change in the nature of the physical movement of the goods.

This contrast may therefore be described as:

2)Ex works and delivered domicile versus f.o.b and c.i.f, which may be called the through transport contrast.

The impact on modal choice of both contrasts will be considered in chapter eleven.

Discussions with shippers prior to preparing the survey on which this work is based showed that the relationship between terms of sale and control of the international transport is not always as straightforward as outlined in this section. For example, some shippers may arrange the international transport and charge the consignee the freight as a separate item in addition to an f.o.b. price., Furthermore, the outline presented in this section may suggest that the party not responsible for international transport is isolated from the transport selection procedure. In many cases this would not appear to be so and transport selection is a collaborative endeavour between sender and consignee. One possible test of involvement in international transport, other than according to the terms of sale, is whether or not a party is aware of the freight rate.

Another factor assumed important in the selection of the transport mode is the number and type of channel members. Kotler (1980) describes four channel levels (p413) which may be paraphrased as:

1) Zero-level channel: manufacturer to consumer
2) One-level channel: manufacturer to retailer to consumer
3) Two-level channel: manufacturer to wholesaler to retailer to consumer
4) Three-level channel: manufacturer to wholesaler to jobber to retailer to consumer (a jobber is a special type of wholesaler found in some industries)

Kotler also mentions the existence of higher level channels but states that they are much less frequently found.

In the area of international marketing Slater (1980) considers that the main marketing channel strategies can be reduced to three basic types. They are:

'(1) Manufacturing site direct to customer:

Where the sale will most likely be f.o.b. a domestic port and the manufacturer will instruct a forwarding agent to arrange transport from the factory to the customer.

(2) Manufacturing site to overseas agent to customer:

Where the sale will most likely be c.i.f. to the agent overseas, and the manufacturer will have to arrange transport to the dock, insurance and freight to a specified dock in the overseas territory

(3) Manufacturing site to overseas warehouse to agent or customer: Where the manufacturer has to arrange the whole distribution package from the domestic manufacturing site to delivery system in the overseas territory including: transport to the dock, insurance, freight, customs clearance, all dock dues and taxes, transport from overseas dock, overseas warehousing and transport from the overseas warehouse.' (pp 171-2).

Slater considers that 'the longer and more complex the channel, the greater the involvement of the physical distribution function, and the more extensive the knowledge required to operate the system' (p 172). Presumably Slater is referring to the involvement of the manufacturer/exporter in this context.

Slater's framework is perhaps relevant for the comparison of strategies within one firm or for non-European destinations; however, it does not accord with the author's experience based on discussion with shippers to W. Europe. The impression gained is that a greater involvement in physical distribution is often required when selling directly to 'customers' (meaning, in the context of this work, predominantly other manufacturers), whereas continental import agents or wholesalers tend to have highly organised buying departments with well-developed relationships with the freight transport industry in each of the countries from which they regularly import goods, and consequently are more likely to buy on ex works or f.o.b. terms. Based on these assumptions it is possible to formulate two hypotheses which will be investigated in the empirical research. They are:

That respondents are more likely to sell on ex works or f.o.b. terms of sale to retailers and wholesalers than to manufacturers and divisions of the respondents' own companies. This is because the former are more likely to have well-established transport service networks in the U.K. based on the likelihood that they purchase from a wider number of suppliers in their role as distributors of a wide range of products.

That the through transport concept (see above) is more likely to be applied where sales are to manufacturers or divisions of the respondents' own companies, and that therefore sales to this type of company are more likely to be on ex works or delivered domicile terms of sale, in contrast to sales to retailers and wholesalers. This is based on the assumption that there is likely to be greater transport collaboration (possibly because of the limited knowledge of the transport system by exporters compared with retailers and wholesalers where the latter have already established transport networks). Furthermore, relationships between divisions of the same company are more likely to be closely integrated because they are ultimately under the same control.

6.3.2 The transport channel

The structural relationship with the transport channel should play an important role in freight modal choice. The range of convenience (using the terminology of personal construct theory) selected for the modal choice study may not correspond with the pattern of relationships with transport companies. For example, a study of choice over a single route may not identify the rigidities in the system that prevent modal change for that route. For example, a contract negotiated with a single carrier to serve all routes for a particular shipper will probably deter change over a single route.

Relationships in the channel of transport may be considered along a number of dimensions. These are:

1) Type of transport company to each destination according to mode.
2) The number of transport companies used for each mode irrespective of destination.
3) The number of transport companies used for each destination according to mode.
4) Length of time transport companies have been used to each destination according to mode.

The type of transport company may be considered in terms of whether or not he is a freight forwarder or a carrier as perceived by the shipper. This may help to identify to what extent the operator is specifically associated with a given destination. In a study of 392 members of the Society of Shipping Executives by Davies and Gray (1980) it was found that 82.6% of respondent shipping managers either strongly agreed or tended to agree that 'it is a good policy to select forwarders who are specialists in particular markets rather than those with general coverage'. It is assumed that a freight forwarder is more likely to provide a general coverage than a carrier, since the latter is more likely to be committed to the destination in terms of equipment. However, since some freight forwarders are also carriers, this distinction is not absolute.

Another aspect of the transport channel is the size of operator - whether large or small. In the survey by Davies and Gray (1980) it was found that 54.7% of respondents either strongly agreed or tended to agree that small forwarders give better service than large forwarders, and that 15.1% of respondents either tended to disagree or strongly disagreed. Such a result may reinforce the preceding finding that a majority of shipping managers prefer to deal with transport companies who specialise in their coverage, or it may suggest that the transport channel is perceived by shipping managers in terms of personal service and agency at which smaller companies may be better, rather than in terms of more advanced technology or equipment which larger companies may offer.

6.4 The role of the shipping manager

Chapter five described the social perceptual approach to freight modal choice. It was assumed that members of social groups within organisations form implicit theories about the technology of the transport system, so that modal choice is assumed to be a conclusion arrived at as a result of a 'theoretical' standpoint. The social group to be considered in the empirical research associated with this thesis is the group of organisational members responsible for organising international transport in exporting companies. Davies and Gray (1979) show that a considerable number of job titles are given to such people and there is no standard title. However, the term 'shipping manager' is widely used to describe the executive employed by exporting concerns responsible for many, if not all, international physical distribution and related functions, and, for the sake of convenience, it will be adopted throughout this work. This section examines the functions undertaken by shipping managers, their location in their employing organisations, and a demographic profile of them.

6.4.1 Functions undertaken by the shipping manager

Much of the data in this section is based on the results of the survey of members of the Society of Shipping Executives (SSE) by Davies and Gray (1980) in 1979. The SSE is the only professional association in the United Kingdom catering for the shipping manager and has a membership of about 1000, of whom 392 replied to the survey. The total number of shipping managers in the United Kingdom is not known although it is certainly much higher than the membership of the SSE. Davies (1981) indicates that the circulation figures of relevant trade publications include

over 11,000 readers classified as shipping managers. Since such publications are free to shipping managers it is probable that most shipping managers would apply for a copy. However, shipping management is known to be a part-time activity (see below) and it is probable that many of the 11,000 readers undertake shipping as a very minor part of their total work activity. It is assumed that members of the SSE tend to be those shipping managers who consider international distribution to be a major part of their work and therefore seek professional status. Therefore, the results of the survey by Davies and Gray arealmost certainly biased towards the professional shipping manager.

The typical tasks of the shipping manager cover a wide span. He is likely to be involved not only in the selection of the transport mode and the international transport operator or freight forwarder, but also in order processing, export invoicing, packing, customer enquiries and credit control among other activities. The tasks undertaken by shipping managers according to the extent of decision making authority are given in table 6.1.

Activity	Level of Decision Making (%)		
	I usually make the important decisions	I am usually consulted	I am usually not involved
Export shipping	82.9	12.9	4.1
Import shipping	56.4	16.8	26.8
Domestic transport	34.1	26.0	39.8
Warehousing	24.6	31.7	43.7
Stock management	13.3	19.2	67.5
Packing	39.1	41.7	19.2
Order processing	40.1	31.1	28.7
Export invoicing	72.8	16.3	10.9
Export selling	13.2	31.2	55.6
Export sales forecasting	11.0	22.2	66.8
Customer enquiries	29.1	40.7	30.2
Credit control	20.1	38.5	41.4
	I usually make the decision	I am usually consulted	I am usually not involved
Selection of transport operator or forwarder	82.9	11.6	5.4
Selection of type of transport (eg air, sea)	70.1	22.9	7.0
Selection of local transport in UK	51.3	25.8	22.9
Selection of local transport in foreign countries	25.5	19.0	55.6

Sample size: approx 392 in each case

Table 6.1 Levels of decision making authority of shipping managers (Source: Davies and Gray 1980)

The tasks given in table 6.1 were analysed by Gray and Davies (1981) in terms of both salary levels and company size, the latter based on total annual export turnover. It was found that the selection of the transport mode is less likely to be decided by shipping managers as a decision making task in larger companies than the selection of the transport operator. This is probably because the selection of the mode is often a superordinate task to the selection of the operator, meaning that a senior manager tends to select the mode and a less senior manager tends to select the operator. It is noteworthy that less than 50% of shipping managers are involved in the selection of foreign local transport in any size ofcompany. This supports the claim of NEDO (1977) outlined in chapter one that British exporters tend not to involve themselves in through transport to the importers' premises.

Gray and Davies (1981) in their analysis of shipping managers according to their salary level found that there were a number of tasks for which the major decision making role was positively related to salary and negatively related to company size. Such activities were domestic transport, stock (or inventory) management, order processing, export selling, and credit control. Gray and Davies conclude that the results suggest a number of higher paid 'all-rounders' in small companies for whom shipping is very much a part-time activity. Indeed, only 56% of all respondents devoted more than 50% of their time to export shipping, although this statistic has to be treated with some caution since the term 'export shipping' is not necessarily interpreted in the same way by all respondents. Shipping managers in small companies are particularly liable to undertake the management of domestic transport or export selling in conjunction with their export shipping activity. The only decision making task which appears to decline noticeably with both increasing salary and increasing company size is export invoicing, although more than 60% of respondents are involved with it at the highest salary level and the largest company size. The results show that documentation preparation is central to the activities of shipping managers, irrespective of the level of salary or the size of the company.

6.4.2 Location of the shipping manager in his employing company

Davies and Gray (1980) found that in the case of reporting relationships there is little evidence of any systematic variation with salary or company size. It was found that shipping managers gave a wide range of job titles for their immediate superior of which the most frequent were 'export manager' (12.8%) and 'company secretary or financial manager' (combined category) (13.1%). Few shipping managers are of sufficient status to report to directors, and very few report to a director whose title is concerned specifically with distribution or even with exporting. Two measures of seniority in British companies may be assumed to be the possession of a company car and the ability to make discretionary spending, other than related to freight transport. The low status of shipping managers in general is evidenced by the fact that 77% do not have a company car and 57% do not have any discretionary spending power.

Shipping managers tend to be the lowest point in the company hierarchy for the selection of the forwarder or transport operator. Only 5.4% of shipping managers allow a subordinate in their department to have total responsibility for selection of forwarder or operator services. In

contrast, 24.7% of shipping managers state that people in their company who are senior to themselves or who work outside their department have a 'major say' in the selection of a forwarder or operator (Davies and Gray 1980). These results suggest that the shipping manager is usually the significant decision maker for the selection of the transport operator or forwarder, although table 6.1 suggests that this is less likely to be the case with the selection of the transport mode, when a more senior member of the exporting company or the importer is more likely to make the selection. The results differ somewhat from the findings of NEDO (1974) shown in table 6.2.

Decision	Director	Senior Management	Middle/ Junior Management	Supervisory Foremen	Clerk
Whether to ship goods by sea or air?	31%	45%	18%	3%	3%
Which forwarder, if any, will be used?	22%	41%	23%	7%	7%

Sample size: approx. 170

Table 6.2 Level of responsibility for mode and operator (Source: NEDO (1974))

The NEDO (1974) results are in terms of management status rather than specific job titles. In the survey by Davies and Gray (1980) it was found that the majority of shipping managers (52.1%) see themselves as middle management, whereas sizeable minorities see themselves as senior management (23.5%) and junior management (17.2%). Only 7.3% do not consider themselves as managers. If the NEDO(1974) and the Davies and Gray (1980) results are compared, it would appear that the NEDO results suggest that transport decisions are more likely to be made at a more senior position in the company hierarchy. This difference in results is probably because the NEDO survey has a much higher proportion of smaller companies. 59% of the NEDO companies had a total turnover (home and export) of less than £1 million per annum in 1974, whereas 35.7% of the Davies and Gray survey had an export turnover of less than £1 million in 1979. About one-third of the Davies and Gray survey had an export turnover which was greater than 60% of total turnover (home and exports combined). Therefore, even allowing for inflation it is likely that the NEDO survey is based on smaller companies.

Nevertheless, another reason for the discrepancy may be that the Davies and Gray survey is based on the reports of shipping managers whereas the NEDO survey is believed to have been based on the reports of directors. The possibility of such discrepancies through differences in perceptions of different socio-organisational groups within a company or in a transport channel, emphasises the need for an explicitly social perceptual approach on the part of the researcher.

6.4.3 Demographic profile of shipping managers

Gross annual salary is a likely indication of the value of employees as perceived by their employing company and Gray and Davies (1981) found that shipping managers' salaries ranged from less than £3000 per annum to more than £10000 (May 1979 salaries), although respondents were predominantly (67.1%) in the range £4000 to £7000. Gray and Davies compared their survey with a survey by Melrose-Woodman (1978) and found that, allowing for inflation, shipping managers predominate in a much lower salary range than managers in general in the United Kingdom, and that the formal educational requirements for membership of the British Institute of Management (BIM) are usually much higher than those for membership of the SSE. 76% of the shipping managers had completed their formal education by the age of 17 compared with 59% of managers in general in the BIM survey by Melrose-Woodman.

6.4.4 Shipping managers as a homogeneous group

The general conclusion to be made about the role of the shipping manager is that he is often involved in a wide number of tasks which are perceived by senior management to be of reasonably low status in the organisational hierarchy. Despite the fact that 43.2% of the respondents in the Davies and Gray (1980) survey were responsible for £100,000 or more export freight expenditure in a year, 67% of respondents who were responsible for freight expenditure did not have to work within a defined budget. This is an indication that senior management does not recognise the importance of international transport as a major item of expenditure. Such results are confirmed in an attitude survey undertaken by Davies and Gray (1980). They found that 73% of shipping managers either strongly agreed or tended to agree that their senior management believed shipping to be a relatively unimportant activity, and 62% either strongly agreed or tended to agree that shipping managers had insufficient contact with top management. Nevertheless, despite differences between shipping managers it would appear that they are a reasonably homogeneous group in terms of work activity and status.

It is important that there is a degree of homogeneity of opinion within a socio-organisational group if we are to attempt to identify an implicit theory which the group may have towards a modal choice. Davies and Gray (1980) asked the membership of SSE a number of attitudinal questions, and table 6.3 suggests that there is reasonable homogeneity of opinion associated with all the questions which refer to shipping managers' perceptions of the international transport world (with one possible exception) in that all the responses are biased towards one pole of the 5-point scale.

Statement	Strongly agree	Tend to agree	Neutral	Tend to disagree	Strongly disagree
	(Response frequency approx. 392 in each case)				
The principle of 'you get what you pay for' is valid for forwarding and transport services	27.9%	36.1%	7.4%	21.5%	7.2%
It is good policy to place all export business in the hands of a single freight forwarder	4.1%	9.0%	7.2%	32.5%	47.3%

Statement	Strongly agree	Tend to agree	Neutral	Tend to disagree	Strongly disagree
	(Response frequency approx. 392 in each case)				
It is good policy to use forwarders in competition, at least on major routes	23.7%	38.6%	19.0%	15.2%	3.6%
It is good policy to use forwarders who are specialists in particular markets, rather than those with general coverage	35.8%	46.8%	10.7%	5.9%	0.8%
Small forwarders give better service than large forwarders	20.2%	34.5%	30.2%	12.8%	2.3%

Table 6.3 Attitudes of shipping managers to international transport system (Source: Davies and Gray (1980))

The exception in table 6.3 is the question associated with 'you get what you pay for', and it is possible that, with hindsight, this particular question is ambiguous.

6.5 Geographical topic area of research

The social perceptual approach to freight modal choice has been presented as a general approach and is therefore assumed suitable for any freight transport situation where modal choice is involved. The specific area of modal choice between air freight and less than full load surface freight transport between the United Kingdom and a number of W. European countries has been chosen for a number of reasons given in chapter one. This section describes the geographical constraint in greater detail and the following section describes the modal constraint.

Table 6.4 shows that a high proportion of British exports go to W. Europe

	Value of exports (f.o.b.) £ million	% of all exports
Austria	254.4	0.8
Belgium and Luxembourg	1843.0	5.5
France	2165.6	6.5
Italy	986.5	3.0
Netherlands	2178.2	6.5
Spain	471.0	1.4
Switzerland	1434.8	4.3
W. German	2526.2	7.6
Total of above countries	11859.7	35.6
U.S.A.	3094.9	9.3
Irish Republic	1648.0	4.9
Sweden	1200.8	3.6
Rest of world	15527.5	46.6
Total worldwide	33330.9	100.0

Table 6.4 British exports by value in 1977 (Source: Annual Abstract of Statistics 1979, Table 12.7 p319)

The European Economic Community (EEC) and the rest of Western Europe together received 53.3% of total British exports by value in 1977. It was decided to select eight W. European countries for the modal choice study which are adjacent and assumed to form the core of overland traffic. The countries selected were Austria, Belgium, France, Italy, Netherlands, Spain, Switzerland and W. Germany. Total visible exports to these countries comprised 66.8% of Britain's total visible exports to W. Europe and 35.6% of Britains total visible exports to all countries in 1977. West Germany and France were, respectively, Britain's second and third largest export markets in terms of value after the U.S.A. (It is reported that more recently W. Germany has overtaken the U.S.A. as Britain's largest export market).

Although most of the larger European markets are included in the modal choice study, some are excluded for geographical reasons. The Irish Republic is excluded since it is not part of the mainland of Europe and it is therefore difficult to make geographical comparisons. The major European markets of Sweden, Norway and Denmark are excluded owing to the relatively long sea crossing compared with the other countries in the study. The Scandinavian countries may be regarded as 'short sea' markets whereas the countries in the study are 'near sea' markets with the possible exception of traffic sent by sea directly to Spain and Italy. However, discussions with shippers and freight forwarders suggest that these two countries were widely served by overland routes through near sea ports.

The countries included in the study correspond exactly with the countries which Coopers and Lybrand (1973) considered as a single zone in the sense of being the primary geographical market for a channel tunnel. The same countries, excluding Spain, were also selected as being comparable in terms of modal choice by Heald (1971) in a study of freight modal choice (in technological positivist aggregated tradition) based on freight rates obtained from freight forwarders related to distance.

In selecting the eight countries the 'range corollary' of personal construct theory does not appear to be violated since shipping managers should be able to make comparisons between the countries along the dimensions of the same constructs. The 'fragmentation corollary' states that people have a hierarchical construct system consisting of different subsystems. In the area of modal choice it was considered that the choice (ie the chooser's preferences in the context of this work) would result not only from a direct comparison of modes over a single route, but also from comparison between experiences on different but similar routes. For example, the level of service obtained from road transport to France might influence the anticipation of the level of service for road transport to Italy.

This section has only considered the geographical destinations. The origins are assumed to exist in a single zone in S. England. Discussion of this aspect is reserved for a more appropriate stage in chapter eight when the survey sample is discussed.

6.6 Modal topic area of research

This section considers the two modes of air transport and less than full load surface transport to W. European destinations.

There are a number of methods of measuring the relative importance of modes. If aggregate weight is the sole criterion, there is little 'choice' (ie as expressed in the modal use) between air and surface transport to W. Europe. According to 'Trade and Industry' (31.8.79) the percentage of United Kingdom export trade by weight to the whole world carried by air in 1978 was 0.4% and, for exports to W. European countries, the percentage ranges from less than 0.1% (Netherlands) to 1.0% (Austria and Switzerland). The proportion of traffic by air increases considerably when it is described in terms of value. In 1978, it was 19.7% for exports to the whole world, and in W. Europe ranged from 6.7% (Netherlands) to 68.1% (Austria and Switzerland). The Netherlands figure is low because of the high proportion of bulk products sent to that country by surface, and the Austria and Switzerland figure is high since it includes a high proportion of traffic in precious stones to Switzerland. A more typical range of proportions of air freight by value is France (13.1%), Italy (15.7%) and W. Germany (13.5%)(Trade and Industry, 31.8.79). In all instances air freight is being compared with all surface transport and not just less than full load transport.

There is evidence that there has been a long-term decline in the proportion of traffic being sent by air to W. European countries from the United Kingdom, in contrast to a growth in the proportion of air traffic from the United Kingdom to the entire world (see table 6.5).

	Year								
Destination	1970	1971	1972	1973	1974	1975	1976	1977	1978
Worldwide	13	14	15	16	17	16	17	18	20
France	29	26	26	23	20	18	14	13	13
Italy	21	20	21	20	18	17	14	14	16
W. Germany	20	19	19	18	18	18	16	13	14

Table 6.5 Exports by air from the UK as a % of total exports by value to selected destinations
(Source: Annual statistics of 'Trade and Industry)

Nevertheless, in 1977 29% of all United Kingdom air exports by value and 23% by weight were sent to EEC destinations (Trade and Industry, 31.8.79).

Weight or value are well-established measures of freight modal choice (see chapter two). However, other measures may also be important when considering modal choice from the standpoint of decision makers involved in the choice, or when considering transport performance from the standpoint of national or company export achievement. Chapter one described the poor reputation of Britain for export delivery despite the importance attached to delivery performance, particularly for consignments to W. Europe (NEDO 1977). Reliability of performance is probably judged by the frequency of unanticipated delivery times rather than the actual speed of delivery. A report commissioned by Barclays International, the British Overseas Trade Board and the London Chamber of Commerce (1979) stated that, although the delivery times of British exporters often compare favourably with those of

French firms and were not far behind those of W. German exporters, Britain's poor reputation was probably based on the poor accuracy of the delivery promise related to the actual delivery time.

In this respect, modal choice may be considered of prime importance for the critical consignment; that is, the consignments which are likely to influence the reputation of an exporting company or country at the point when the level of delivery reliability becomes critical. In other words, at the point when an unacceptable level of customer service is about to be attained. At such a point it is possible that an exporter may switch from a slower to a faster mode of transport.

A survey by the Civil Aviation Authority (CAA) has shown that the 'need for urgent delivery' is the characteristic of air freight most frequently given as a reason for using air freight (CAA 1977). The same survey found that 80% of British exporters use air freight, although fewer than 50% use it for more than 5% of their tonnage. Unfortunately the survey does not investigate the nature of urgency beyond relating it to the type of air service (see below) and the consignment size. The CAA found no relationship between consignment size and the degree of urgency (defined by the type of air service) for Europe or North America, although the degree of urgency diminished with increasing consignment size for the Rest of the World. This is probably a result of the establishment of split charter services (see section 6.2.5) in areas other than Europe and North America. This analysis is limited in its usefulness since it apparently only considers the consignment size of air consignments. Furthermore, the definition of 'urgency' is that of the CAA rather than of shippers. Nevertheless, the high use of premium services (those offering a high probability of the goods leaving on the next flight), which account for 60-65% of air freight consignments to European destinations, must indicate the need for a high degree of urgency over the relatively short distance to W. Europe where there is a well-developed surface transport network. The other types of air service defined by the CAA are a guaranteed service (guaranteeing departure within a specified period) and a deferred service (goods carried when space is available).

Another measure related to modal choice which is relevant to the social perceptual approach is the work involved in despatching a consignment. If goods are sent by a non-routine mode (assumed to be air), the preparation of such consignments may have a disrupting effect on the routine behaviour of the department(s) responsible for the movement of the goods in the exporting firm. To what extent can urgency be made routine and what is the relative search activity involved before despatching an urgent and a non-urgent consignment? Such aspects would appear to be valid measures of the impact of modal choice. There is no reason why a small low value or low tonnage consignment requires less managerial or clerical work than a large consignment. Indeed, the latter may require less managerial work for the shipper if it is the routine method of shipment. In the absence of a more suitable measure, the number of consignments would appear to be the most appropriate measure of managerial/clerical activity devoted to each mode by the shipper. There is no published data comparing modes by the number of consignments as perceived by the shipper. However, this measure is examined later in the empirical research associated with this thesis.

In the empirical research, consideration of surface shipments is restricted

to less than full load shipments, since these are more likely to be in direct competition with air than full load consignments. The weight distribution of air freight consignments is predominantly in the weight range of presumed less than full load consignments. The CAA survey of air freight demand shows that 59.5% of the total tonnage of air freight consignments to Europe are 500kg or less, and only 16.1% of the tonnage is over 2500 kg. However, in terms of number of consignments, 97.3% of shipments to Europe by air are less than 500 kg (71.6% are less than 45 kg).

It does not appear possible to estimate with any accuracy the extent of less than full load surface traffic from the United Kingdom to any destination. The primary source of international surface transport data is the National Ports Council (NPC) and since, from the NPC standpoint, there is no difference between a full load container or trailer from a single exporter and a consolidated container or trailer from a single freight forwarder, no distinction is made. Furthermore, NPC statistics are based on the port of delivery, rather than the destination country of the goods, so that a high proportion of transhipped and onforwarded goods intended for deep sea destinations are allocated to a country such as the Netherlands.

The only study which appears to have examined the nature of consignment sizes for surface transport to W. Europe is that by Coopers and Lybrand (1973). The results described in this paragraph are estimates by the author based on a scaled histogram of Coopers and Lybrand. Since the study was undertaken about a decade ago it is uncertain whether or not circumstances have changed. According to Coopers and Lybrand 17% of total tonnage and 55% of total consignments by surface were less than 9 tons (imperial) in weight. 9 tonnes (metric nowadays) is a typical maximum weight on a groupage rate scale offered by a freight forwarder. In fact, there is no precise definition of 'groupage'. Thomas Meadows Ltd, a large freight forwarder, in their advertising material consider that groupage becomes 'part load' at about 4 tonnes. They define part load in a reference manual (Meadows 1979) as the activity when surface consolidators collect the larger less than full load consignments directly from exporters and then complete the loading of the trailer or container with smaller groupage consignments already at their depot. However, not all shippers would make this distinction . 6% of total tonnage and 41% of total consignments were less than 3 tons in weight (3 tons was the smallest quantity considered) in the Coopers and Lybrand study. If the results are still valid, they show the relative aggregate unimportance of groupage in terms of weight and its importance in terms of number of consignments which, as stated earlier, may be equated with decision making activity.

It is believed that most less than full load surface traffic from the United Kingdom to the eight destination countries is by 12 metre (long) road trailers. Practically all the operators advertising in a groupage directory (Maclean Hunter 1979) offer trailer services. In an earlier study of groupage services to W. Germany only (Gray 1977) 93% of 59 shippers stated that road trailer was the international mode for their groupage.

If consideration is restricted to road trailer services it is possible to make use of the NPC statistics since it is believed that few trailers (unlike containers)are transhipped at European ports for final deep sea

destinations. Table 6.6 shows the average load in tonnes for trailers for near sea traffic in 1978. For exports it is 11.5 tonnes.

Loaded (000 units)		000 tonnes of goods		Average load (tonnes)	
Imports	Exports	Imports	Exports	Imports	Exports
504	456	6456	5261	12.8	11.5

Table 6.6 Near sea traffic in road goods vehicles/trailers Great Britain 1978
(Source: National Ports Council (1978))

If the Coopers and Lybrand estimates are still valid, consignments less than 9 tonnes would total 894,400 tonnes (17% of 5,261,000 tonnes) and consignments less than 3 tonnes would total 315,700 tonnes (6% of 5,261,000 tonnes) to 'Europe' (countries unspecified but assumed to approximate to the eight countries in the proposed empirical research and most likely to be served by near sea ports). Even the lower figure for consignments less than 3 tonnes, where air might be considered more directly competitive in terms of consignment size, is higher than the world-wide United Kingdom air tonnage of 297,000 tonnes in 1978 (Trade and Industry, 31.8.79). Thus, an estimate of market share by weight of air compared with groupage is shown in table 6.7.

All figures in 000 tonnes

Air	Surface groupage less than 9 tonnes
60*(6.3%)	894.4 (93.7%)
Air	**Surface groupage less than 3 tonnes**
60*(16.0%)	315.7 (84.0%)

Table 6.7 Estimated market share by weight of air and surface less than full load transport to 8 W.European countries in the study
(*Air statistic from 'Trade and Industry' 31.8.79)

The relative cost of surface groupage transport and air transport is likely to be an important factor in modal choice. Freight rates are charged on a weight or volume basis; for surface groupage to W. Europe the shipper normally pays on the weight unless 100 kg exceeds 0.3 cubic metres, whereas for air transport he normally pays on the weight unless 100 kg exceeds 0.7 cubic metres. For both modes the unit cost decreases as consignment size increases. Surface transport generally has a single rate for all commodities, whereas air transport to a large extent has rates based on commodities.

Typical rates (mid 1979) are shown in table 6.8. In addition the total cost of transport would include terminal and documentation charges which may exceed the pure freight costs for smaller consignments. A typical consolid-

ated charge for costs incurred in the United Kingdom would be about £15 for a consignment of 250 kg for both surface groupage and air freight (1979 prices), although groupage consolidated charges vary considerably and a lower rate could be obtained for an air consolidated service offered by a freight forwarder.

Rates per 100 kg for 250kg consignment of electrical machinery

Depot or airport London to depot or airport	Surface groupage	Scheduled air
Paris	£3.20 to £ 5.23	£16.68
Milan	£4.70 to £ 7.60	£41.00
Zurich	£5.45 to £11.35	£36.00
Frankfurt	£4.75 to £ 6.60	£35.00

Table 6.8 Typical comparative freight rates for surface groupage and air (mid 1979)

Rates were obtained on behalf of the author by several members of the Society of Shipping Executives, so that realistic rates likely to be offered to genuine shippers could be collected. Table 6.8 shows the wide range of possible surface rates offered over the same routes. It is also noteworthy that some forwarders offered 'package deals' based on overall volume of business, which makes it difficult to establish a standard overall cost for a specific consignment. This reveals another limitation of research based on considering transport costs over a single route at the disaggregate level where the decision making of the shipper is assumed to be studied (something often undertaken in economic or technological positivist studies). The researcher should be certain that the transport costs are entirely route-specific.

As a broad generalisation, air freight appears to cost about three or four times the equivalent surface cost. Rates for express vans (a fast scheduled road service) vary from firm to firm and do not appear to have found their appropriate level at the time of writing.

Minimum charges for air freight may be similar to or lower than those for surface groupage, so that very small consignments (say, up to 20 kg) can be sent by air at a similar cost or lower than surface transport.

CHAPTER 7. THE OPERATIONAL MODEL

7.1 Association with the conceptual model

The social perceptual approach to freight modal choice assumes that modal choice refers to human intention and not to modal use. The concept of an 'implicit theory' was developed in chapter five when the conceptual model was presented. The notion of a theory suggests that modal preferences are embodied in a body of knowledge which is ordered and rational in terms of the 'theori st's' experience, or, in other words, subjectively rational. Although theories may be particular to individuals, in the sciences there are generally schools of thought based on a pool of common knowledge and experience, and it is assumed that this also applies to the commercial world of practical management. Since it is not conventional to draft theories in a formal manner, other than in the academic world, such theories are assumed to be implicit.

Chapter two described how some models of freight modal choice at the level of the firm attempt to explain choice in terms of technological relationships (technological positivist approach) whereas others seek an explanation in economic terms (economic positivist approach). The third approach (perceptual approach) assumes that modal choice is based primarily on the transport user's subjective interpretation rather than directly on physical attributes which may be measurable by the researcher. Chapter five described an alternative approach called the social perceptual approach. The essential nature of the social perceptual approach to freight modal choice presented in this work is contained in two assumptions:

a) The assumption of implicit theories about specific technological activities

b) The assumption that such theories are associated with specific social groups (predominantly task groups when considering business organisations).

The theoretical support for these assumptions is presented in detail in chapter five.

A complete study of modal choice would require an examination of the implicit theories of all groups involved in any given modal choice. In the context of international freight transport such groups might include shipping, marketing, warehouse and finance personnel within the exporting company. It is possible that other groups outside the exporting company may also be involved in the modal choice decision. Such groups are most likely to be involved in the channels of trade and transport along which the exported goods move. The channel of trade includes institutions concerned with the trading of the product (eg importers) and the channel of transport includes institutions responsible for transporting the product (eg freight forwarders).

There are two major problems in converting the conceptual model described in chapter five into an operational model capable of empirical application. First, the subject area is complex and often involves a number of different organisations for each freight movement and, within an organisation, possibly a number of different people or groups. Second, since an implicit theory is implicit it is difficult to identify it.

The current research is conducted within financial constraints which prevent the analysis of complete systems of individuals, groups and organisations involved in modal choice. In this respect, any empirical work may be considered as no more than exploratory. Chapter six has discussed the role of the shipping manager in international freight transport and has identified the nature of his role as an issue of debate in the industry. Therefore, it appears worthwhile to investigate the implicit theory of shipping managers. In this work, the possible implicit theories of other socio-organisational groups will be derived from published literature.

The second problem in developing an operational model appears more difficult to overcome. If an individual involved in modal choice has his own ordered frame of reference towards choice, how do we discover of what it consists? This work has stressed the importance of identifying the rationality of the individual as well as obtaining aggregated results. Nevertheless, some form of aggregation is required to obtain generalisable results. The approach adopted in this chapter is to assume that an individual possesses an implicit theory of modal choice, and that evidence of its form may be obtained through his description of a specific modal choice situation within the constraints of a formal model. That is, a formal model constraining the individual subject (shipping manager) who is being researched (as opposed to constraints on the researcher). Each subject is provided with the same modelling technique based mainly on the repertory grid as a framework for data content, although the subject, as far as possible, provides his own input to the model in terms of content. The formality of the model permits subsequent aggregation to the entire group of subjects.

The objective of this work is not to test the implicit theories of the subjects but to describe them. In operational terms, the description is of each individual's formal model of modal choice where the form is provided by the researcher and the content is, as far as feasible, provided by the subjects. Assumptions about the nature of implicit theories will be based on the nature of the models in association with other data.

7.2 The basic operational model

This section develops the basic or outline operational model to be used in the research. The basis for operationalising the concept of implicit theories is described and the assumed major influences on such implicit theories are considered.

7.2.1 Models of implicit theories

The modal choice of any individual is assumed to be a conclusion arrived at as a result of the individual's theoretical standpoint. The action (ie modal use) taken from that standpoint is assumed to be dependent not solely on the theoretical standpoint of the individual., but on the interaction of the standpoints of several individuals, unless a single person dominates absolutely (which is the assumption in many freight modal choice models where the perceptions of individuals are equated with the 'firm' or a single consensus 'buying centre". The social perceptual approach suggests that in order to understand modal use it is useful to examine theoretical standpoints in the context of socio-organisational relationships. The obvious difficulty in gaining knowledge of such theories is that they are not formally stated. Chapter four suggested that it may be possible to gain insight into 'cognitive structures' through the application of the repertory grid technique. The representation of such structures may be considered as models based on the implicit theories of the individuals. By examining the models of a number of representatives of a particular social group it may be possible to establish the common theoretical ground or the 'agreed theory' of the group. Therefore, the basis of the empirical work should be to obtain the structures or interrelationships of concepts and objects (constructs and elements in the language of personal construct theory) of individuals before any attempt is made to aggregate data for the entire group.

The conceptual model described in chapter five assumes that implicit theories are applied to specific aspects of the transport system known to the shipper. Chapter two described how Bayliss (1972) is critical of 'market research' studies (ie studies which attempt to determine the importance of various modal attributes to shippers) for being too general and for not referring to specific commodities or activities. An assumption of the social perceptual approach described in chapter five is that the subject tests his implicit theory by measurement (eg of transit time) of specific services, so that general statements about 'road' or 'rail' are, in themselves, unacceptable. However, there is no reason to suppose that general perceptions of particular services do not exist. Cunningham and Kettlewood (1975), for example, identified a general perception of inferior performance by British Rail compared with road transport among buyers of freight transport. An advantage of the social perceptual approach adopted in the current work is that individual shippers are encouraged, as far as possible, to reveal personal theories about specific activities, so that general perceptions common to all or most of them may be compared with specific perceptions.

By adopting this approach it is intended to avoid the type of cross-level fallacy described in chapter two where it is possible to infer falsely that what is true for groups is true for individuals (see also de Neufville and Stafford 1974). It is considered undesirable for research into freight transport to lose sight of the individual unit (whether person, group or firm) since it is difficult to classify firms as a set of homogeneous units. For example, some researchers

have sought homogeneity in commodity characteristics, an approach which often overlooks the organisational and social aspects of firms.

In order to obtain individualised models where the influence of the researcher is restricted, it is desirable to use a survey technique which minimises the imposition of constraints on respondents in the form of supplied subjects or categories. Within reasonable limits subjects should be provided with nothing more than the modelling technique to which they add their own content. This may be achieved through the process of elicitation described in chapter four, section 4.3.4. Section 7.3 of the current chapter considers the development of the elicitation procedure in detail.

In summary, the three tenets on which the design of the operational model is based are:

a) it should be possible to examine interrelationships between relevant factors at the level of the individual

b) the work should explicitly examine specific situations, and

c) the individual should, as far as feasible, provide the content of his own model of modal choice.

7.2.2 Socio-organisational influences on implicit theories

Chapter six described how international distribution is an open social system so that shipping managers may be seen as boundary personnel involved in both intraorganisational and interorganisational activities. Intraorganisational activities are formally defined by the location of the shipping manager in the organisational hierarchy and by his functions or the tasks he performs. It is difficult to generalise with a high degree of precision about the relationship of functions to personnel. Davies and Gray (1979) and Gray and Davies (1981) have shown that export shipping management is often linked to such other functions as importing, order processing and invoicing (described in detail in chapter six). Furthermore, the shipping manager does not exist in isolation, but must collaborate with colleagues. Most studies of organisational buying behaviour (see chapter three) suggest that there is a decision making process involving a number of people or groups within the organisation. Chapter six (introducing subject area) described the findings of NEDO (1974) and Davies and Gray (1980) in the area of the division of functions (specifically mode and operator choice) between personnel in general, and between the shipping manager and other personnel with superordinate or subordinate status or with a lateral relationship to the shipping manager. Chapter six also described the nature of the trading channel and the transport channel which are likely to be influences on the behaviour of the shipping manager. Such influences are considered in the empirical work under the general heading of socio-organisational influences.

7.2.3 Technology of the transport system

The technology of the transport system is seen in the interaction of physical features of the transport system and physical features of the product. Transport is seen as a technological system which processes products by transforming them spatially. Such features may be considered as technological flow variables and are relevant to the social perceptual approach in terms of their identification of modal use, and in terms of the discriminability of the shipping manager.

7.2.4 The complete basic operational model

The collection of data required in the basic operational model may be divided into four broad categories:

a) elicitation of elements (route-services *)

b) elicitation of constructs (personal statements about route-services)

c) obtaining technological data associated with products and route-services.

d) obtaining socio-organisational data associated with respondents (ie shipping managers)

* A route-service is defined as a route and a mode used by a shipping manager (eg road groupage to Spain).

The remaining sections in this chapter describe the development of the data collection procedure associated with the full operational model presented at the end of this chapter. The sequence of description of the development of the data collection is:

a) general development of the elicitation technique (section 7.3)

b) elicitation of route-services (section 7.3.1)

c) elicitation of statements (constructs) about route-services (section 7.3.2)

d) preparation of repertory grids (sections 7.3.2 and 7.3.3)

e) obtaining technological & socio-organisational data by postal questionnaires (sections 7.3.4 and 7.3.5)

The sequence of presentation is adopted for the sake of clarity. However, in practice, as indicated in the following section, the stages of data collection are largely interdependent and their development was an iterative process. The framework of the basic operational model is shown in figure 7.1. The full operational model is presented later in figure 7.5. A large proportion of the

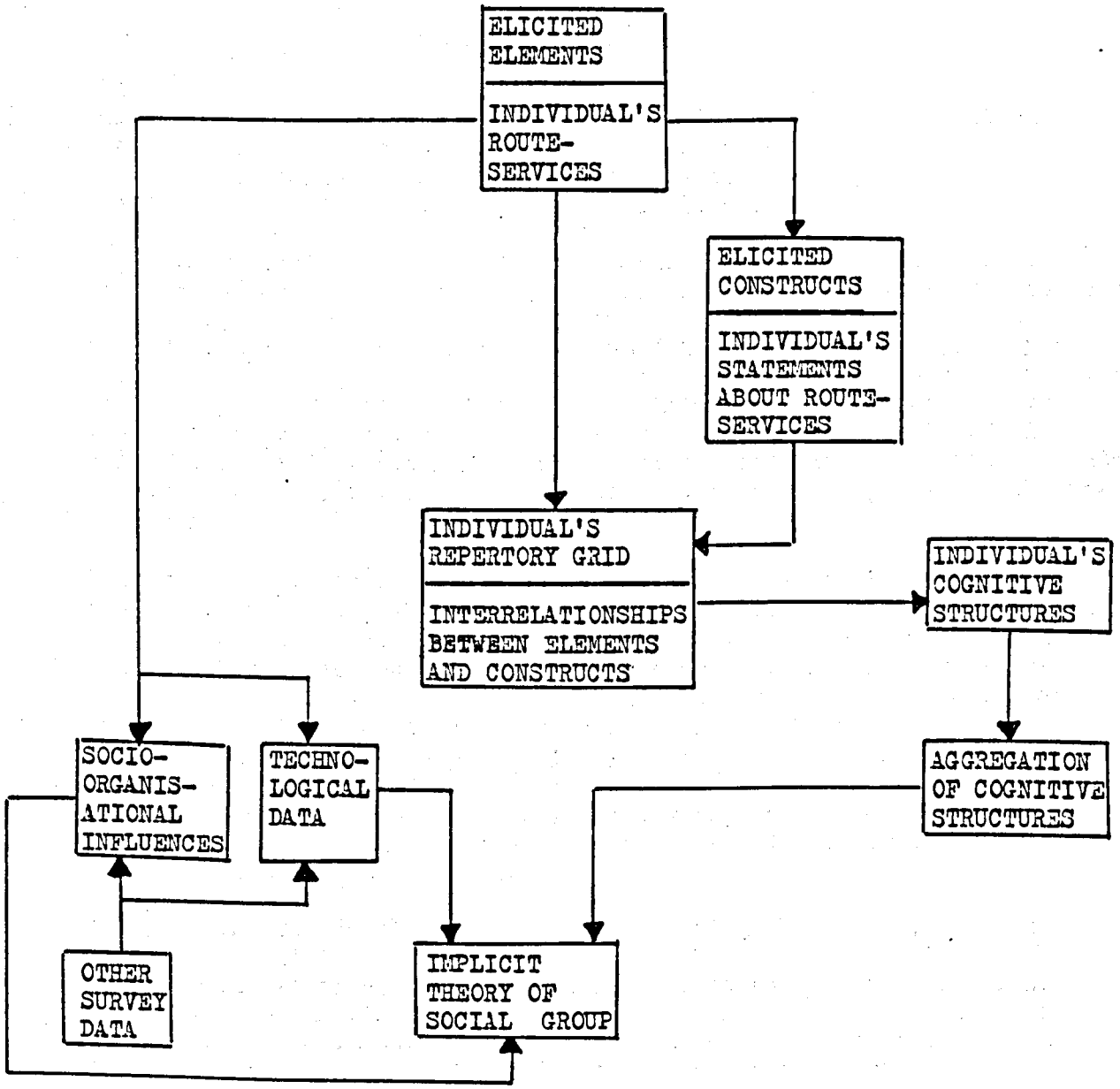

Figure 7.1 The basic operational model

discussion is devoted to the elicitation of statements about route-services and the subsequent repertory grids since this was the most complex area of the empirical work.

7.3 Developing the elicitation procedure

There are two basic stages in the repertory grid procedure: first, the elicitation of constructs and elements, and second, the completion of the grid; that is, the assessment of the constructs against elements by the respondents. The objective of this section is to describe how a suitable elicitation procedure was developed.

Preliminary tests of elicitation and grid complection were conducted on five members of the Centre for Transport Studies, Cranfield (students and staff) during June and July of 1978. The objective at this stage was to enable the researcher to become familiar with the repertory grid technique. Therefore the subjects areas chosen, although concerned with freight transport, were related to the interests of the respondents rather than to the topic of this thesis. A number of levels of elicitation were tried, ranging from the complete elicitation of both elements and constructs to all elements and constructs being supplied by the researcher.

The next stage, conducted during August and September 1978 was to test the technique on six shipping managers during visits to their companies. All six subjects were responsible for both air and sea transport to W. Europe. The objective of this stage was to gain familiarity with the repertory grid both in terms of the subject matter of this thesis and in applying it to the appropriate social group. No attempt was made to obtain results for comparability (which would, of course, be a major consideration of the actual survey to be made later). Therefore, each successive interview was a development of the preceding interviews, and changes in the approach were made during the course of successive visits to firms.

A number of procedural problems emerged during this stage. It was found that a visit required about 1½ to 2 hours to allow adequate time for elicitation, grid completion, and to obtain other details. However, some shipping managers were reluctant to accept a visit if it was announced in advance that it would require 2 hours of their time. Therefore, it was decided not to mention any particular interview time unless requested to do so. This, in turn, produced difficulties on two occasions when the visits were terminated before the procedure could be completed owing to other engagements on the part of the shipping manager. Furthermore, in some cases there were interruptions either from the telephone or from other members of staff. Such aspects no doubt reflect the status of the shipping manager which has been discussed in chapter six. In many instances he is not sufficiently senior in the firm to isolate himself from routine day to day activities.

The use of the triad technique of construct elicitation, although successful when applied to members of the Centre for Transport Studies, Cranfield, proved difficult to operate with shipping managers. In this technique the subject is presented with three

elements and asked to specify some important way in which two of them are alike and thereby different from the third. Some respondents required considerable time to undertake a single comparison. The technique was developed in clinical psychology where the client is, in a sense, the 'captive audience' of the psychologist. This is certainly not the case when interviewing middle management at work. They are also in the role of expert vis-a-vis the interviewer, particularly since it is important for the interviewer to adopt a neutral stance when eliciting so as not to influence the nature of the elicited constructs. In such circumstances it is necessary to conduct an interview which makes sense to the subject, and it was felt that the triad method was somewhat contrived in the eyes of some subjects.

Therefore, it was decided to use the 'dyadic elicitation' method which simply requires the subject to compare two elements at a time. This technique has been used by psychologists in applying the repertory grid technique (eg Allison 1972). Fransella and Bannister (1977) state that 'Kelly based his triad method for eliciting constructs on his theory as to how constructs are first formed. But since one is eliciting constructs already established in the person's repertoire there is no reason why three elements need be used. The triad is not even necessary to ensure obtaining the opposite of the emergent pole given .... There is nothing sacrosanct about the triad. It is equally reasonable to use two elements for elicitation or more than three ..... ' (p15-16). The use of the dyadic approach proved more suitable, and its application is discussed in section 7.3.2.

A further problem encountered in the preliminary interviews was how to prepare the repertory grid for completion, since this could only be commenced after completion of the elicitation stage. Two approaches were possible: either a written grid was presented to the subject for self-completion, or the interviewer extracted the assessments of constructs against elements verbally. The largest grid encountered during the preliminary stage consisted of eight elements by ten constructs, thus requiring eighty assessments or judgements. It was not satisfactory to obtain these judgements verbally since it became somewhat tedious for both the interviewer and the subject to examine such a large number of judgements in sequence. Furthermore, it was considered much easier for subjects to make comparative judgements when they were able to look at the grids. It would appear that the rating scales used (discussed in more detail in section 7.3.3) contain a relative component as well as an absolute one. In other words, the assessment of, say, air freight to Belgium in terms of transit time is likely to be influenced by the assessment of air freight to Holland. The implications of the technique used on the types of errors encountered in rating scales (eg the halo effect) are considered in section 7.3.3.

In the circumstances it was decided that a better approach was for the subject to complete the grid in writing. However, this created the problem of preparing the framework of the grid before it could be completed. An example of an actual grid used in the final survey is shown in figure 7.2. With experience, this proved to be the most suitable form of grid for the subject matter of this thesis, but it requires considerable preparation on the part of the researcher. It must be remembered that before the elicitation stage neither the constructs nor the elements are known. The only known factor is that there will be eight elements.

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PLEASE READ THE NOTES ON THE YELLOW PAGE BEFORE ANSWERING THESE QUESTIONS

1. This service is

1 = Very fast 2 = Quite fast 3 = Neutral 4 = Quite slow 5 = Very slow 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

2. Your relationship with the forwarder or operator is

1 = Very good 2 = Quite good 3 = Neutral 4 = Quite bad 5 = Very bad 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

3. The range of quality of transport operators or forwarders is

1 = Very wide 2 = Quite wide 3 = Neutral 4 = Quite narrow 5 = Very narrow 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

4. For this service, you prefer the size of your forwarders' or operators' company to be

1 = Very big 2 = Quite big 3 = Neutral 4 = Quite small 5 = Very small 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

5. Availability of services (ie road vehicles, aircraft) on this route is

1 = Very good 2 = Quite good 3 = Neutral 4 = Quite bad 5 = Very bad 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

6. Documentation requirements for the destination country are

1 = Very difficult 2 = Quite difficult 3 = Neutral 4 = Quite easy 5 = Very easy 0 = No opini

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

7. Delays through transhipment or handling happen

1 = Always 2 = Often 3 = Neutral 4 = Seldom 5 = Never 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

Figure 7.2 Example of a repertory grid to be completed

8. For the price paid, the total transit time is

1 = Very good 2 = Quite good 3 = Neutral 4 = Quite bad 5 = Very bad 0 = No opinion

Air to Austria	Road groupage Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

9. The operator or agent you use on this route is requested by the customer

1 = Always 2 = Often 3 = Neutral 4 = Seldom 5 = Never 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

10. The final delivery from the continental depot or airport to the final destination is

1 = Very fast 2 = Quite fast 3 = Neutral 4 = Quite slow 5 = Very slow 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

11. This service is used when goods are late or required urgently

1 = Always 2 = Often 3 = Neutral 4 = Seldom 5 = Never 0 = No opinion

Air to Austria	Road groupage to Austria	Air to Belgium	Road groupage to Belgium	Air to France	Road groupage to France	Air to W Germany	Road groupage to W Germany

Figure 7.2 (cont)

In the preliminary interviews it proved possible only to write the elements across the top of the page and not above each construct, which increased the risk of the respondent completing the grid incorrectly. It was also necessary to use A3 size paper with the concomitant difficulties of writing on a clip board. An alternative approach would have been to provide a separate sheet for each element or each construct. However, this would not only have required a considerable amount of writing, with each element or construct being repeated on each sheet, but would also have required a great number of sheets of paper which may have proved discouraging to the subject. For example, the matrix of ten constructs by eight elements would have required eight separate sheets if each element were on a separate sheet, and ten sheets if each construct were to be presented separately.

Fortunately it was possible to develop what emerged as a successful technique based on two lessons from the preliminary interviews. First, it was clear that only the elicitation stage required direct personal contact, and that the grid completion and the answers to the ancillary questions required nothing more than a written questionnaire. In fact, it is probably preferable if the researcher is not present during completion of the grid, since it enables the subject to complete it at his leisure. Second, the obtrusiveness of the telephone was noticed during some of the interviews, and it appeared that this might prove a successful medium for elicitation. Although telephone interviews are widespread in marketing research (eg see Green and Tull 1978), there is no evidence of their use in the repertory grid literature.

The approach adopted was to telephone shipping managers and elicit constructs using the dyadic approach over the telephone, having previously established that the subject would be prepared to complete a written questionnaire based on the telephone interview. After completing the telephone elicitation, individual grids for each subject were prepared, despatched, and from a sample of three preliminary contacts, all were returned within two weeks of despatch. The individual questionnaires, which were in the form described in figure 7.2 were now able to be neatly typed in that form, and each took from one to two hours to prepare for despatch to the respondent, depending on the number of constructs. In terms of cost-effectiveness of the research, this is of course a labour-intensive approach, but it is considered that the time period could be greatly reduced with the use of electronic word processors, and that the use of questionnaires which have been largely structured by the subject or respondent may prove relatively easy to prepare in the future. The use of word processors enables the standardisable parts of the questionnaire to be preprogrammed for typing.

It was now considered that a suitable procedure had been developed for a pilot survey. Details of samples and response rates of the pilot and the main surveys are given in the following chapter.

7.3.1 The elicitation of route-services (elements)

The elicitation of elements was accomplished by asking respondents to state to which of the eight countries (Austria, Belgium, France, Italy, Netherlands, Spain, Switzerland, W. Germany) they sent shipments by air

and by surface less than full load. Respondents were also asked to specify the submodes (eg scheduled air freight, road groupage) used for each country.

Chapter two described how different modal choice studies adopt different interpretations of the nature of modes and how it is possible to identify four major classifications of mode which are:

a) evident physical difference

b) patterns of ownership

c) potential size of consignment

d) abstract mode

It is possible to apply more than one of these classifications to any given freight modal choice situation so that the 'mode' may be said to have the capacity to adopt a number of 'roles'. A shipping manager may assess a mode on the basis of any one or more than one of the assumed roles. It is considered that the assumption of a multi-role perspective increased the probability of greater understanding of the basis of choice.

The modal roles assumed in the operational model are largely in keeping with the accumulated knowledge of other modal choice studies and are derived from the above-mentioned four classifications of modes. The modes are classified in the operational model in terms of

a) basic mode, referring to evident physical differences between surface transport and air transport

b) submodes, which may be divided into classifications according to evident physical differences (eg rail groupage and road groupage) and/or the potential size of the consignments (eg road groupage and road part load)

c) operators, referring to the pattern of ownership or type of owner of transport facilities (eg freight forwarder, road haulier)

d) preferences, (eg most preferred air service, least preferred air service). Unlike most studies of freight modal choice, the current study examines preference both within and between modes over different routes within an homogeneously perceived area (eight countries of W. Europe). A preference may be considered as a composite evaluation which, in this work, is broken down into individual constructs through the rep test.

In the sense that each route-service may be allocated a particular combination of construct ratings by means of the repertory grid, there is a conceptual similarity with the abstract mode approach where each mode is described in terms of combinations of characteristics known to the shipper. The difference in approach is that the abstract mode approach (as described by Baumol and Vinod 1970) is based on standard attributes which it is assumed may be costed, whereas the approach

adopted in this work is to elicit from shippers non-standard attributes which are capable of being rated by the shippers. The abstract mode approach is based on econmic cost minimisation or the equation of marginal cost with marginal revenue, whereas the emphasis of the current work is to examine perceptions within an organisational context. The abstract mode approach equates the shipper (and hence his knowledge) with the firm, whereas the current work makes explicit the socially derived nature of knowledge.

e) destinations, some of the modal choice studies described in chapter two are mainly concerned with choice between modes over a single route or, at least, between modes with the same origin and destination points. However, as already stated, such choices are not made in isolation and any choice will be influenced by similar choices applicable to similar situations. Personal construct theory assumes that the assessment of elements (in this case modes) is made within a 'range of convenience' and that, according to the 'range corollary', constructs are convenient for only a finite range of events or objects. Chapter six has explained how the eight selected W. European destination countries appear to provide a suitable range of convenience owing to the similarity of several aspects of transport. Whilst it is important to ensure that all elements fall within a range of convenience it would also appear sensible not to restrict the range unrealistically. In many instances modal choice between two modes over a single route might appear to be an unrealistic restriction if the objective is to understand the nature of human choice in freight transport. For example, dissatisfaction with a given mode to zone A may influence the use of the same mode to zone B. This is particularly relevant when the same carrier is employed for both zones A and B or where a single carrier is equated with a mode (eg where British Rail is the only rail carrier).

Basic differentiations or measurements of modal choice were established by asking respondents in an initial postal questionnaire to identify their most preferred and least preferred service for each basic mode (air and surface) in terms of country, submode and type of transport operator. This, therefore, established the parameters of choice between countries within basic modes. It was decided that the specification of choice between basic modes within countries was too difficult to include in an initial postal questionnaire and this aspect was reserved for the construct elicitation stage.

7.3.2 The elicitation of constructs and preparation of repertory grids

After receipt of the elicited route-services, respondents were selected to undertake the telephone elicitation of constructs from those who had given their names as willing to take part in a further survey.

The single basic requirement regarding knowledge of transport services was that each respondent should have had experience of at least four countries from the eight countries in the study for air and surface transport. Otherwise, beyond this there was no particular requirement except that preference was given to those respondents where four within-country modal choices could be made; that is, the respondents who sent consignments by both air and surface transport to the same four countries.

Since shipping management is essentially a desk-bound job, in contrast, for example, to sales management, it proved easy to contact respondents by telephone, and only in a few instances did it prove necessary to telephone a firm more than once. A standard script was developed to introduce the researcher over the telephone. It went:

> 'Good morning/afternoon Mr ..... My name is Richard Gray and I am a student at Cranfield Institute of Technology. Recently you were kind enough to complete a questionnaire about transport services to W. Europe, and you gave your name as someone prepared to give a bit more information.
>
> What I would like to do is send you a second questionnaire, but I would be grateful if I could ask you a few questions over the phone. These are questions about your opinions of transport services which are difficult to enter on a written questionnaire.
>
> Is that OK? '

Once the respondent had signified his acceptance (and none refused), the following standard interview procedure was followed. Respondents were asked:

1. 'Your most preferred less than full load service was by (sub-mode) ..... to (country) ..... You gave as a reason ..... Could you elaborate on this?' (If no reason was given in the original questionnaire, the respondent was simply asked 'What reason can you give?' - this applies to similar subsequent questions).

2. The same question was then asked about the least preferred surface service.

3. 'What other things do you look for in less than full load surface services to W. Europe?'

4. 'Your most preferred air service was by (sub-mode)..... to (country) ..... You gave your reason as ..... Could you elaborate on this?'

5. The same question was then asked about the least preferred air service.

6. 'What other things do you look for in air services to W. Europe?'

7. 'Your consignments by (sub-mode) ..... to (country) ..... (Least preferred surface service). Why do you use surface rather than air transport?'

8. The same question was then asked about the most preferred surface service

9. 'Your consignments by (sub-mode) ..... to (country) ..... (least preferred air service). Why do you use air rather than surface transport?'

10. The same question was then asked about the most preferred air service.

The sequence of modes (air or surface) was alternated for each respondent to avoid the possibility of the characteristics of a single mode dominating subsequent responses for the entire sample of respondents.

It was essential for the researcher to avoid expressing opinions about freight transport in case he influeneed respondents' replies and such neutral statments as 'What do you mean by that?' and 'Any other reasons?' were used throughout.

The results of the interviews may be considered as being somewhere between the fully elicited constructs obtained by some clinical pyschologists over a number of hours with their clients, and the supplied constructs of the environmental perceptual studies described in chapter four. During the telephone interview the researcher wrote down the core of the statements made by the respondents (eg 'Brussels - quick service'), and after completion of the interview, such statements were converted into formal constructs suitable for assessing the entire array of elements. For example, the above statement became 'this service is generally very fast - very slow' (the extreme poles of a five point scale - see below section 7.3.3).

In such circumstances it is obviously impossibleto avoid some form of 'interviewer bias'. However, it can be argued that it is impossible to avoid bias of some form in any research concerned with the experiences of people, and that one must attempt to understand the nature of 'bias' rather than attempt to avoid it through what may be a spurious standardised approach. Interviewer bias generally refers to the effect of bias made apparent when comparing the results of a number of interviewers employed on large sample research when all other identifiable factors have been accounted for. This use of the word 'bias' suggests a systematic error in the survey results caused either consciously or unconsciously by a particular interviewer. Where the researcher is also the interviewer there are two aspects of bias. First, there is the aspect already described where there may be systematic bias caused, for example, by the researcher's interview manner. The other aspect of bias is the 'bias' of the entire research work, in that it is to a large extent the mental construction of the researcher and all outside facts are filtered through his perceptions.

In a standardised questionnaire the researcher's bias is in the structure and content of the questionnaire. The dimensions of the survey are entirely those of the researcher and the subject's contribution must comply with such dimensions. The approach adopted in the repertory grid technique is to allow, up to a point, the subject to prepare his own questionnaire. Thus,the questionnaire is more likely to reflect the subject's experience than a generalised questionnaire. Examinations of experience do not appear amenable to the techniques of direct observation applied to natural science. The use of a personal questionnaire, designed to suit

the subject's own predispositions, reduces the limitations of the standardised approach which may be remote from the individual subject's experience. However, when using personalised questionnaires there is the possibility of unintentional researcher interference with responses. This is most likely in completely unstructured surveys as, for example, in case studies which are based on unstructured or loosely structured interviews. The structure proposed in this work attempts to strike a balance between the rigidity of standardised contact and the limited structure of many case studies.

It is not suggested that personalised questionnaires reveal the true nature of experience, merely that they are a step in the right direction. Although there is a tradition of personal questionnaire techniques in psychology (eg Philips in Slater 1977), they have yet to receive widespread acceptance in some applied areas, including transport, where studies may involve aspects of experience. There appear to be two possible reasons for this. First, as far as transport studies are concerned, the impetus for the research has been from the direction of large-scale studies for planning purposes (see chapter two) and there has been a tendency to seek similar approaches at the level of the firm which, in many cases, means at the level of the individual, since the firm is often equated with an individual in surveys. The second reason may be the the difficulty of making generalisable statements about personal questionnaires. However, the capacity for making such generalisations is increasing. In recent years a number of developments in analytic techniques have taken place which make a comparison of personalised questionnaires more easy. One such technique is described in chapter four in the discussion of the application of personal construct theory to environmental perception studies. This research will apply other techniques, which will be described in chapter twelve. Furthermore, the technique of preparing personal questionnaires is likely to be simplified with the use of word processors which are able to store the standardised parts of personalised questionnaires in a memory. An example of the grid-questionnaire has already been given in figure 7.2, showing it at the state before completion by the respondent.

7.3.3. The personal repertory grid

After completion of the telephone elicitation and preparation of the grid, each respondent was sent a supplementary questionnaire which included his personal repertory grid for completion. This section considers the structure of the repertory grid.

Respondents were required to rate constructs against elements (ie statements against route-services) and the following instructions were given to respondents on grid completion.

1. 'The questions are based on topics raised by you during our recent telephone conversation. Therefore, each recipient has a different questionnaire. You are asked to rate eight transport services to W. Europe against a series of questions. In most cases you will have used all the services listed. Where you are not familiar with a particular service, you are invited to give your opinion. Such services can be considered as potential alternatives to transport services already used by you.'

2. 'You are asked to rate each of the services on 5-point scales. Please do not spend a long time thinking about each question. The scales are only intended to give general impressions and are not regarded as precise measures.

   As an example of a completed scale, suppose you have the statement

   'Security during transit is

   1 = Very good 2 = Quite good 3 = Neutral 4 = Quite bad
   5 = Very bad 0 = No opinion '

   you might answer

Air to France	Air to Holland	Air to Italy	Air to W.Germany	Road groupage France	Road groupage Holland	Road groupage Italy	Road groupage W.Germany
1	1	2	4	1	2	3	1

   'The above answer shows that you consider security during transit is 'very good' for shipments by air to France and Holland, 'quite good' to Italy and so on. Obviously, this is a fictitious example and is not intended to influence any of your answers.

3. 'On each scale there is rating '3 = Neutral'. Please take this as the mid-point of the scale. In the above example, road groupage to Italy is rated '3'. This particular neutral rating means that the road groupage to Italy is seen as somewhere between 'quite good' and 'quite bad' for security during transit.

4. 'As an alternative to selecting from the 5-point scale, you may enter '0' meaning that you have no opinion, and are therefore unable to make a rating. Even where you know little about a particular service, your opinion is of interest as a potential user of a service. Therefore, please enter 'no opinion' only as a last resort.

5. 'It should be stressed that only your immediate opinion is required. Please do not spend more than a few seconds on each question. However, please make certain that there is an entry in every box.'

The text assumes that in some instances respondents may not have used the route-services. In the event, it was possible to find sufficient respondents who had used eight route-services. The particular combination of route-services varied from respondent to respondent within the basic framework of four air and four surface route-services.

There are a number of problems associated with the use of rating scales such as the five-point scale. The first problem is the number of rating points to use, since the literature advocates any number of points ranging from a simple dichotomy (Kelly 1955) to twenty-five points (see Guildford 1954). Guildford suggests that the number of points is a matter of empirical determination in any situation, although he concludes that the optimal number is likely to be more than seven. In this conclusion he differs from Symonds (1924, quoted in Guildford (1954)), who suggests that reliability (ie inter-rater correlation) increases by an amount that is small compared with the additional effort required to complete scales with a greater number of points. Conklin, in Guildford (1954), based on analysis of 23,000 ratings, states that 5-point scales should be used for unipolar rating and 9-point scales for bipolar rating. More recent writers (eg Slater 1977) suggest that five-point or seven-point scales are the most widely preferred by researchers and that most researchers prefer a neutral rating at the centre of the scale with an equal number of grades above and below it. Slater, who has processed thousands of repertory grids on behalf of other researchers, suggests that a seven-point scale is not much more sensitive to variation than a five-point scale since subjects tend to ignore grades two and six. Since the current research requires respondents to make a large number of ratings (it ranged from 40 to 104)it was decided to use the simplest widely advocated rating scale of five points.

A further problem concerned the design of the form for completion by respondents. There are two aspects to consider in this context. First, there the errors inherent in the use of rating scales which may be dependent on the form design, and, secondly, there is the aspect of designing a form which is suitable for a postal questionnaire. Guildford (1954) describes a number of 'errors' which may emanate from the use of rating scales. These are (a) the error of leniency (b) the error of central tendency, (c) the halo effect, (d) a logical error in rating and (e) a proximity error. The error of leniency refers to the tendency to rate more extremely those issues which are better know to the rater. Similarly, the error of central tendency occurs when raters place the lesser known issues nearer the meanof the total group of measures. The halo effect refers to the tendency to form a general attitude towards an issue, and then to rate the issue in a similar manner on all scale items. The logical error in rating is similar to the halo effect in that raters are likely to give similar ratings for issues which they consider logically related. The proximity error refers to the tendency for adjacent issues on a rating form to intercorrelate higher than remote ones, even when issues are arranged in a random manner. A further type of error described by Hughes (1975) is the problem of 'anchoring' where a different meaning may be attached to the same term by different people. For example, 'fast' when describing a motor car may mean 50 miles per hour to one person and 150 miles per hour to another.

Whether or not such 'errors' are really errors depends on how one wishes to interpret the rating scales. For example, Fransella and Bannister (1977), considering the contrast between the error of leniency and the error of central tendency, describe how some researchers suggest that the tendency to use extreme points indicates pathology or maladjustment. Other writers have, in contrast,

suggested that it is a measure of personal meaningfulness of the scales, supported by evidence which shows that more extreme ratings are usually found when constructs have been elicited rather than supplied. Bonarius (1971) suggests that it is an interaction between the object (element) rated, the rater and the poles of the construct. It is probably impossible to eliminate this type of error entirely, although Hughes (1975) has suggested a form design which may reduce the halo effect and the anchoring problem. He calls it the upgraded semantic differential (the terminology indicates that he is writing in the tradition of Osgood et al 1957 - see chapter four for a discussion of the similarities and differences between the semantic differential and the repertory grid technique). The traditional form of questionnaire used in the semantic differential often shows a single issue on each sheet with a list of attributes for rating (see figure 7.3)

For car make X, ring the appropriate rating

Slow	1	2	3	4	5	(6)	7	Fast
Cheap	1	2	3	(4)	5	6	7	Expensive
Comfortable	1	(2)	3	4	5	6	7	Uncomfortable
Attractive	1	2	3	4	(5)	6	7	Unattractive

Figure 7.3 Traditional Semantic Differential Question Form

A separate page is provided for each make of car. The upgraded semantic differential proposed by Hughes is, in contrast, of the form shown in figure 7.4 and may be completed on a single page for all makes of car.

Enter each make of car in the appropriate bucket

Slow	1	2	3	4	Y 5	XZ 6	7	Fast
Cheap	1	2	3	XYZ 4	5	6	7	Expensive
Comfortable	1	X 2	3	Y 4	5	Z 6	7	Uncomfortable
Attractive	1	2	3	Y 4	X 5	Z 6	7	Unattractive

Code: Car make X = X, Car make Y = Y, Car make Z = Z

Figure 7.4 Upgraded Semantic Differential Question Form

Hughes suggests that the approach used in the design of the upgraded semantic differential may overcome the halo effect and the anchoring problem since the respondent is concurrently rating and ranking objects. It also has the advantage of being a much shorter questionnaire in terms of paper required, so that, according to Hughes, it is more likely to have a favourable impact on respondents. This last aspect is uncertain; for example, Downs (1978) suggests evidence to the contrary, finding that in a comparative test the more traditional forms of the semantic differential were preferred and required less time to complete. As with other aspects of rating methods, there are conflicting viewpoints in the literature. It was decided to use the form of grid questionnaire shown in figure 7.2 which is similar in form to the upgraded semantic differential. This form was preferred in view of its facility for concurrently rating and ranking objects, and in the light of the assumed initial impact on postal respondents.

7.3.4 Technological data

In order to identify the nature of the physical flow through the transport system, respondents were asked to supply basic product information. This consisted, for each of the four parameter route-services (most and least preferred air and surface route-services), of the name of the product, the number of consignments, the approximate value-weight ratio and the approximate volume-weight ratio.

Respondents were asked to supply a 'measurement' (eg transit time) for the four parameter services. This approach may be considered as a method of defining the poles of supplied constructs, using the terminology of personal construct theory. For example, a supplied construct 'good transit time/ bad transit time' may be measured, for instance, as 2 days / 7 days' in the implicit theory of a particular respondent in a specific context. (This ignores for the sake of discussion the probability that transit times are only satisfactorily considered in terms of variability of transit time - see for example Miklius and Casavant (1975) discussed in chapter two). In keeping with many studies of freight modal choice it was assumed that time-based factors with a spatial constraint were likely to be among the predominant measures of a transport service.

An assumption of the study is that the destination country (eg France, Belgium) is a valid unit or zone of analysis, and that shippers are likely to perceive a country as a single geographical point in terms of their analysis of the transport system. This assumption requires validation, particularly where time-based factors are concerned, and therefore it was necessary to obtain further spatial information beyond mere knowledge of the destination country.

Spatial factors were intended to identify which of the supplied nodes of the route were significant from the respondents' standpoint. The supplied nodes were the points of origin and final destination and the two points en route where the goods are most likely to change mode; that is, the operators or forwarder's depot in the United Kingdom (for surface transport) or the depot or airport in the United Kingdom (for air trasnport). The depots for surface less than full

load are often inland and remote from sea ports, and it was not considered, for the purpose of this study, that actual sea ports were likely to be significant to respondents unless the operator's depot was based at a sea port. This assumption was supported in a number of operators' advertising leaflets obtained by the author. Such leaflets always show the address of the receiving or departure depot which is obviously required by the exporter to know where to send his goods. The address of the continental arrival depot is sometimes given, although not always. The details of the route to be followed are never given, presumably to allow flexibility on the part of the transport operator in the use of ports; for example, to enable him to select the most suitable port in terms of sailing schedules at any given time.

The spatial nodes were required in order to estimate an approximate distance for the journey which could be related to other aspects of the transport system. It was known that some respondents send goods to more than one town in some of the destination countries and, in some instances, it would have been preferable to obtain data about all such destinations within a single country. However, it was considered that this would place an undue burden on respondents, and therefore it was decided to restrict answers to the single most frequent destination in each country by the four parameter services. After establishing the exact destination towns on the questionnaire, respondents were then asked to answer questions about services to those towns, rather than about the countries in which they were situated.

Time-based factors refer not only to when goods are moving, but also to when they are stationary. Chapter six described the concept of consolidation or grouping of small consignments into a larger consignment, and consolidation is likely to result in delays in departure, whether planned or unplanned. Therefore, respondents were asked not only to give the total transit time door to door, but also to provide replies to questions which might suggest the respondents' perceptions of delays in the transport system. These were the frequency of departure of the international vehicle from the operator's depot or from the airport, and the frequency of collection from the exporter's premises by the operator.

In the logistics approach (see chapter two) the total transit time is a component of other activities, one of which is the total order cycle time or the period from the date on which the exporter's customer sends his order to the date on which he receives his goods. In order to gain a picture of the relative importance of transit times in the total order cycle time, respondents were asked to give the time from receipt of the customer's order to despatch from the exporter's warehouse. In a previous work by the writer (Gray 1977) it was found that a common measure of transit times used by shippers for surface groupage services to West Germany was a two-day unit (eg 1-2 days, 3-4 days). Since the current work is interested in the nature of the measurement of time by respondents, it was decided not to supply any unit of measurement beyond asking that the total transit time door to-door be given in days. Furthermore, respondents were encouraged to enter, according to preference, either a single figure (eg 6 days) or a range of days (eg 2-4 days).

Within this context respondents were asked to give their most likely transit time door to door. The encouragement to provide a range of days meant that it would be possible to consider the 'most likely' transit time as a crude measure of the 'mean' transit time, and the range of days of the 'most likely' transit times as a measure of the perceived acceptable range (it should be emphasised that respondents were asked for the range of most likely transit times, not the range of all expected transit times). Such measures are obviously imprecise compared with the actual transit times, but it was assumed that they are more likely to influence the respondent in his implicit theory of modal choice (insofar as transit time may be taken to influence modal choice), since they are more likely to reflect his perception than actual times which may not be known to the shipping manager or recorded by him.

The same approach was adopted for the lead time from the receipt of the customer's order to despatch from the respondent's warehouse, except that the time was requested in weeks rather than in days. This was in accordance with stated lead times being generally given in weeks during preliminary discussions.

7.3.5 Identification of the socio-organisational group

There were two underlying reasons behind the objective of identifying the socio-organisational group. First, in order to throw light on the nature of the group it was necessary to 'place' the respondent in his firm in terms of work functions. Secondly, in order to test the representativeness of the sample, it was necessary to ask questions which could be compared with independent data.

In order to identify their status, respondents were asked the name of their department, their own job title, the job title of the person to whom they reported, and the director responsible for their department. In order to identify the work content of their jobs, respondents were asked what proportion of their time they devoted to export shipping. If export shipping was not their major activity, they were asked what other function predominated and how much time they devoted to it. Respondents were asked to give their degree of involvement in a number of activities commonly associated with export shipping (see Gray and Davies 1981). Such activities are import shipping, domestic transport, warehousing, stock (inventory) management, packing, order processing, export invoicing, export selling, export sales forecasting and customer enquiries.

Three levels of involvement in the various activities were assumed. These were:

a) as the important decision maker

b) not an important decision maker but consulted, and

c) not involved.

Respondents were also asked about their involvement in modal choice, both in terms of selection of mode or type of transport and in

selection of transport operators. The assumed levels of degree of involvement were:

a) as sole decision maker

b) as joint decision maker with others in the same organisation

c) as joint decision maker with the customer

d) not involved.

The basic product information obtained to identify the nature of the physical flow through the transport system, and described earlier in section 9.1, may also be considered as an identifier of the firm. In addition, a measure of company differentiation which has been shown to be an important measure of the size of organisation in terms of international transport, is the annual export turnover and the annual number of export consignments to all destinations by all modes (see NEDO 1974, Davies and Gray 1979).

The trading channel relationship between the exporter and the importer was established by asking respondents to specify whether their customer was a retailer, a wholesaler or distributor, a manufacturer, or, a division of the exporting company. Chapter six described the nature of distribution in export markets and how it may be simplified to the above categories. Respondents were encouraged to enter any other type of trading relationship with their customer.

Respondents were also asked to give the terms of sale. In chapter six it was described how the nature of the terms of sale were considered by the writers of the NEDO (1977) report as a major contribution to the effectiveness of British exporting. The terms of sale are likely to influence the nature of decision making since whichever company pays the freight would be expected to select the transport mode and operator. The selection of the mode and operator may be assumed to be influenced, although not necessarily determined, by the terms of sale. For further clarification of the relationship between the terms of sale and the payment of freight respondents were asked to give the freight rate for the parameter service. Knowledge of the freight rate was assumed to indicate a greater probability of involvement in the selectionof the mode. (The freight rate was also originally intended as a 'technological' variable. However, so few directly comparable freight rates were obtained that this idea was discarded at the analysis stage).

Chapter six has discussed the range of potential transport channel relationships between shippers and their forwarders or transport operators. Chapter three introduced the concept of source loyalty, referring to the propensity of purchasers to use the same supplier for similar goods or services. In keeping with the approach to freight modal choice adopted in the current study, source loyalty may be seen in terms of loyalty across different route-services and in terms of loyalty over time within a service or a route. In the former case, respondents were asked to give the particular combinations of transport operators (eg whether the same operator was used for all four parameter services, or whether a different one was used for each of the four services -

intermediate combinations were also possible answers). An indication of source loyalty within a particular service was also obtained by requesting the number of operators or forwarders used on a specific service in the past year. An indication of loyalty over time was sought by asking respondents how long they had been using the forwarder or operator with most of their business on each of the four parameter services.

7.4 Collection of data

The data which was supplementary to the repertory grid was collected by means of two postal questionnaires. This section presents the exact data required under each of the categories described in the previous section. Questionnaire design is inevitably a compromise between:

a) the data requirements of the researcher

b) the logical expectations of the respondents

c) the avoidance of the undue influence of one question on another, unless required

d) maintaining the interest of the respondent

e) the design constraints of questionnaires

This section examines the main problems encounted in the questionnaire design and how they were treated.

The postal survey was in two parts and with two different objectives. The first survey was intended to

a) obtain sufficient suitable respondents to prepare personal repertory grids

b) obtain a minimum of data should the respondent not wish to participate further.

The second survey was intended to obtain much greater detail about the four specific parameter route-services (most and least preferred air and surface services).

In the first survey the respondents were approached without prior contact whereas the second survey was conducted with respondents who had expressed a degree of commitment to the survey by being prepared to give further information. Details of the sample of respondents are given in the following chapter. The exact forms of the questionnaires used in the postal survey are given in appendix A (first survey) and appendix B (second survey). This section describes the content of each questionnaire categorized according to the headings described in the preceding sections. The content is not shown in the sequence of the actual questionnaires (for this see appendices A and B), which was based, in the judgement of the researcher, on the compromise of factors described earlier in this section. For some questions the wording has been changed slightly from that used in the actual questionnaires

to aid understanding (significant changes are indicated by parentheses). Similar questions asked about different route-services have been condensed for simplicity. It is essential to refer to appendices A and B to appreciate the exact form of the questionnaires.

7.4.1 First questionnaire

7.4.1.1 Question objective: to obtain initial details for personal repertory grids

Question: Do you have exports to W. Europe?

Answer: Yes/No

Question: To which of the following countries did you send AIR shipments during 1978?

Answer: Scheduled airfreight/Charter airfreight/Other (specify) to Austria/Belgium/France/Italy/Netherlands/Spain/Switzerland/W. Germany.

Question: To which of the following countries did you send LESS THAN FULL LOAD shipments during 1978?

Answer: Groupage by road/Part load by road/Groupage by rail/Express van/Other (specify) to Austria/Belgium/France/Italy/ Netherlands/Spain/Switzerland/W. Germany

Question: Assume you had to rank all your AIR entries in (the question requiring the countries to which air shipments were sent) having weighed up all the relevant factors which form your opinion. Which would you put in FIRST place ?

Ditto for LAST place

Ditto for LESS THAN FULL LOAD surface shipments - FIRST and LAST place.

Question: Please award each service (FIRST and LAST placed AIR and LESS THAN FULL LOAD) a score for overall quality, where 9 = extremely good, 5 = neither good nor bad, and 1 = extremely bad.

Answer: Entry on scale of 1 to 9.

Question: What is/are your main reason(s) for ranking the AIR service (given) in FIRST place?

Answer: Free description by respondents.

Ditto for AIR service in LAST place, and LESS THAN FULL LOAD services in FIRST and LAST place

Respondents were also asked to give their names if they wished to participate in subsequent surveys.

Comments

This series of questions establishes a general framework of both modal choice (defined in this work as the preference of the individual) and of the modal use of both the potential sample to complete repertory grids and of a larger validatory sample. The 9-point general evaluation scale and the reasons for rating decisions provide basic information to compare with the much more detailed repertory grids.

7.4.1.2 Question objective: to identify technological flow variables

Question: (For the AIR services and LESS THAN FULL LOAD services ranked FIRST and LAST) approximately how many shipments did you have in 1978?

Answer: Free entry by respondents (ie no category boxes) of actual number of shipments for each of the four parameter route-services.

Question: (For the AIR services and LESS THAN FULL LOAD services ranked FIRST and LAST) what was the size of your individual consignments by each of the services? Please answer this question to the degree of accuracy most convenient to you.

Answer: Lightest consignment weight and heaviest consignment weight and approximate most likely consignment weight (all in kg for each of the four parameter services).

Question: What are your principal products sent to the markets described in the survey?*

Answer: Free description by respondents.

* This question also has the objective of identifying the nature of the respondent's firm.

Question: Very approximately, what would be the ex works value of 1000 kg (one tonne) of your principal products?

Answer: £ ..... (free entry by respondents)

Question: What is the approximate cubic measurement of 1000 kg (one tonne) of your principal products?

Answer: 1000 kg=..... cubic metres/cubic feet - delete as appropriate (free entry by respondents).

7.4.1.3 Question objective: to identify respondent's socio-organisational group

Question: What is your job title?

Answer: Free entry by respondents.

7.4.1.4 Question objective: to identify trading channel relationships

Question: (For the AIR services and LESS THAN FULL LOAD services ranked FIRST and LAST) what are your terms of sale?

Answer: Ex works/FOB UK airport or depot/CIF European airport or depot/ Free delivered customer's premises/Other (specify).

7.4.1.5 Question objective: to identify transport channel relationships

Question: (For the AIR services and LESS THAN FULL LOAD services ranked FIRST AND LAST) which of the following types of organisation best describes the international transport organisation with which you are in direct contact?

Answer: For AIR - Large general freight forwarder/small general freight forwarder/large specialist air forwarder/small specialist air forwarder/airline/other.

For LESS THAN FULL LOAD surface - Large general freight forwarder/small general freight forwarder/large road haulier/ small road haulier/shipping line/railway company/other.

7.4.1.6 General comments on 1st questionnaire

Wherever feasible, respondents were required to provide their own data without the prompting of category boxes. It is, of course, difficult to generalise about what is feasible, but a general rule, adopted after preliminary discussion with a number of shipping managers, was to avoid direction regarding numerical answers through the use of category boxes. There has been little research in the area and, since large-scale pilot surveys are inappropriate, suitable categories are difficult to determine. Furthermore, it was considered that the use of categories for numerical data was more likely to influence respondents' answers through the provision of an anchor (the category scale). However, it should be stressed that such questionnaire design decisions are to some extent necessarily arbitrary.

7.4.2 Second Questionnaire

As for the first questionnaire, in the description of the second questionnaire some questions have been amended to ease the understanding of the reader (significant amendments are in parentheses).

7.4.2.1 Question objective: to identify specific destinations for subsequent questions

In order to avoid ambiguities, the questions in the second questionnaire which refer to the four parameter route-services (ie FIRST and LAST ranked AIR and LESS THAN FULL LOAD surface services given in the first questionnaire) refer to specific final destination towns in the destination countries.

Question: (For each of the four parameter route-services) do you send goods to more than one place in the destination country by the type of transport shown below?

Answer: Yes/No

NB The parameter routes-service are pre-entered by the researcher based on data from the first questionnaire. Appendix B shows the blank second questionnaire and appendix C shows a second questionnaire in the form received by a respondent for completion.

Question: Please write the name of the town of final destination for your consignments by the types of transport shown below. (If you send consignments to more than one destination for any of the parameter services) please enter the single most frequent destination. DO NOT ENTER MORE THAN ONE TOWN ON EACH LINE.

Answer: Name of final destination town for each parameter route-service.

Comment

Respondents were henceforth required to answer questions about a specific destination town rather than a destination country. Ideally, it would have been desirable to ask questions about all destination towns. However, this was considered impracticable and would have extended an already lengthy questionnaire.

7.4.2.2 Question objective: to identify technological flow variables

Question: In the earlier questionnaire you gave a very approximate ex works value of £ ..... for 1000 kg of your principal products. Does this value still apply (for each of the four parameter destinations)?

Answer: Yes/No. If NO, please give alternative approximate value for 1000 kg.

Question: Approximately what percentage of your consignments are regular, repeat orders of much the same size and product mix (for each of the four parameter route-services)?

Answer: Less than 25% / 26-50% / 51-75% / 76-100%

Question: What is the frequency of departure of the international vehicle (aircraft, trailer etc) from the British operator's depot or airport (for each of the four parameter services)?

Answer: At least daily / 4 times a week / 3 times a week / Twice a week / Once a week / Less than once a week / It varies a lot

Question: Does you operator or forwarder collect from your premises (for each of the four parameter route-services)

Answer: At least daily / 4 times a week / 3 times a week / Twice a week/ Once a week / Occasionally as requested / Never

Question: For each of the (four parameter) services, where does the journey start in Britain (the town where your factory or warehouse is situated)?

Answer: Name of town.

Question: For each of the (four parameter) services, where is the operator's or forwarder's depot or airport in Britain. (If London, please indicate approximate area, eg North, South-east etc) ?

Answer: Name of town.

Question: From your experience, what is the most likely total transit time door-to-door between the start of the journey and the final destination? Please give your answer in DAYS. You may prefer to enter either a single figure (eg 7 days) or a range of days (eg 2-4 days).

Answer: Free entry by respondents.

Question: For your principal product(s) sent by each (of the four parameter services), please would you give the most likely time from your firm's receipt of the customer's order to despatch from your warehouse. Please give your answer in WEEKS for each service. You may prefer to enter either a single figure (eg 3 weeks) or a range of weeks (eg 3-7 weeks)

Answer: Free entry by respondents.

Comment

The four nodes of the total transit are clearly established (the final destination serves a wider function in this questionnaire and has already been considered in section 7.4.2.1. The question about regular, repeat orders also serves as an identifier of trading relationships.

7.4.2.3 Question objective: to identify the respondent's socio-organisational group

Question: (For each of the four parameter route-services), if it were decided to change the type of transport (eg from air to surface or vice-versa) what would be your personal involvement in the decision?

Answer: You would make the decision alone / It would be a joint decision between you and others in your company / It would be a joint decision between you and the customer / You would not be involved.

(This question may also be an identifier of the trading relationship when it refers to the customer).

Question: (For each of the four parameter route-services), if it were decided to change the transport operator or forwarder what would be your personal involvement in the decision?

Answer: Same form as preceding question.

Question: What is the name of your department?

Answer: Free description by repondent.

Question: Whom do you report to?(job title)

Answer: Free description by respondents.

Question: Which director is responsible for your department? (job title)

Answer: Free description by respondents

Question: Very approximately, what proportion of your time is devoted to export shipping?

Answer: 0% / up to 25% / 26-50% / 51-75% / 76-100%

Question: If export shipping is not your major activity, please state what is and approximately what proportion of your time you devote to it.

Answer: Activity: free description by respondent. Time = ...%

Question: In what ways are you involved with the following activities in your company?

Answer: I usually make important decisions OR I do not make important decisions but I am usually consulted OR I am usually not involved

FOR EACH OF:

Export shipping/ import shipping/ domestic transport/ warehousing/ stock (inventory) management/ packing/ order processing /export invoicing/ export selling / export sales forecasting/ customer enquiries.

7.4.2.4 Question objective: To identify the respondent's firm

Question: What is your company's approximate total annual export turnover?*

Answer: Less than £½ million / £½M-£1M / £1M-£2M / £2M-£5M / £5M-£10M / £10M-£15M / £15M-£20M / £20M-£30M / £30M or more

* Respondents who worked for a group of companies were asked to answer only for the part of the group for which they work.

Question: Approximately how many export consignments (shipments) did your company send worldwide in 1978?

Answer: Up to 99 / 100-499 / 500-999 / 1000-2499 / 2500-4999 / 5000 -9999 / more than 10000.

* Comment as for previous question.

7.4.2.5 Question objective: to identify trading channel relationships

Question: (For each of the four parameter route-services) what type of company is your customer?

Answer: Retailer / wholesaler or distributer /manufacturer /division of your company / other (please specify)

Question: What is the size of your individual consignments by each of the (four parameter) services? Please answer this question to the degree of accuracy most convenient for you (eg nearest 100 kg)

Answer: Lightest consignment weight and heaviest consignment weight and approximate most likely consignment weight (all in kg)

Comment

This question has already appeared in the first questionnaire. The answer is required to complete the questions about freight rates (see below). Where respondents had already given the weight details in the second questionnaire, these were entered by the researcher in the second questionnaire. The question serves the dual function of identifying the freight rate and a technological flow variable (see section 7.4.1.2)

Question: What is the current international freight rate for your most likely consignment weight? (see previous question) (for each of the four parameter route services). If it is not known to you please enter 'not known' against the appropriate services.

Answer: Freight rate (please state currency) AND rate basis (eg per kg, per 100 kg, minimum etc)

Question: Do the above rates include the following charges? If YES, please tick the appropriate box.

Answer: Handling and documentation in UK/Cartage to UK depot or airport / Continental customs clearance and-or handling / Final delivery on the continent

Question: From what date were the freight rates valid?

Answer: Beginning 1978/ Mid 1978 / Beginning 1979 / Other (please specify)

Comment

The sequence of question referring to freight rates indicates the difficulty of achieving homogeneity of rates for comparative purposes. The difficulty in achieving a comparative basis prevents freight rates from being used with any confidence in assessing the relationship between the shipper and the transport operator.

7.4.2.6 Question objective: to identify transport channel relationships

Question: (For each of the four parameter route-services) how many operators / forwarders have you used in the past 12 months?

This refers only to those with whom you have been in direct contact.

Answer: Number of operators / forwarders (free entry by respondents)

Comment

The reference to 'direct contact' is to avoid double-counting where a freight forwarder sub-contracts business to other forwarders or transport operators. An exporter sometimes employs a single 'house' forwarder to arrange all international transport and such a forwarder may sub-contract business to other forwarders with the exporter's (possibly tacit) consent. This is in contrast to forwarders who may claim to undertake transport which may be sub-contracted unbeknown to the exporter.

Question: How long have you been using the forwarder / operator who has most of your business on each of the (four parameter) services?

Answer: 0-6 months / 7-12 months / 1 or 2 years / 3 or 4 years / 5 or 6 years / 7 - 9 years / 10 years or more.

Question: On how many of the four (parameter) services are you using each of the forwarders or operators described (in the previous question)? Please tick YES or NO boxes as appropriate.

Answer: The same one is used for all four services / A different one is used for each of the four services / The same one is used for both air services / The same one is used for both surface services.

Comment

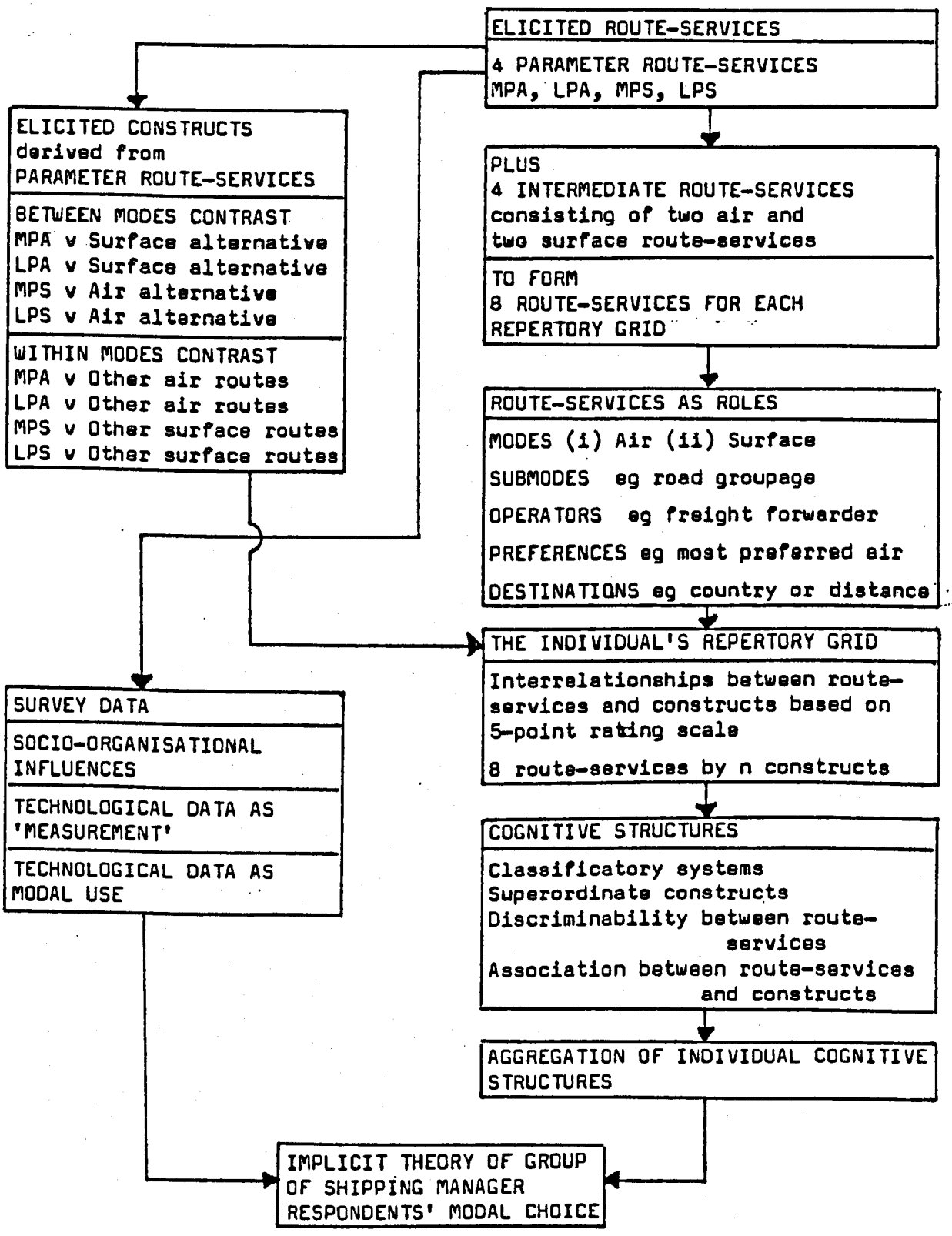
Restricted space on the questionnaire prevents an exhaustive range of combinations. The selected range is considered adequate to identify whether or not respondents adopt a different approach in their use of forwarders or operators for air and surface transport.

7.5 General comments on questionnaire data

Certain questions were included to provide validatory data from a wider sample to assist in assessing the representativeness of the respondents completing repertory grids. At the time of preparing the questionnaires the writer was also involved in the preparation of a survey of the entire membership of the Society of Shipping Executives (with G J Davies) some results of which have been presented in chapter six. It was therefore possible to obtain further evidence of the representativeness of the sample in the work described here by comparing its results with that of the larger Davies and Gray survey through a number of questions common to both surveys.

7.6 The full operational model

Section 7.2 presented the basic operational model as shown in figure 7.1. The subsequent sections considered each aspect of the model in detail and the full operational model related to those sections is presented diagrammatically in figure 7.5. The following chapter considers the sample to which the operational model was applied.



KEY: MPA = most preferred air route-service
LPA = least " " "
MPS = most preferred surface route-service
LPS = least " " "

Figure 7.5 The full operational model

CHAPTER 8. THE SAMPLE AND FRAMEWORK OF ANALYSIS.

This chapter is divided into two main parts. The first part describes how the survey sample was obtained and the second part outlines the stages of analysis in the following five chapters.

8.1 The survey sample.

The population from which the survey should be drawn is all shipping managers in firms exporting by both surface less than full load transport and air freight transport to at least two of the eight countries described in chapter six. A problem common to many studies of freight modal choice is the difficulty in identifying the population since there are no lists which publish the above information. Lists of exporters to specific countries are published by a number of commercial organisations (eg Freight Information Services, Kompass). However, it is uncertain how such organisations obtain the names on their lists. In order to be able to control the structure of the sample it was decided to use a sample selected from the mailing list of International Freighting Weekly (IFW), a trade paper issued free to shipping managers. The list was kindly made available to the author by Maclean Hunter Ltd., the publishers of IFW. IFW has a circulation of about 21,000, of which about 11,000 classify themselves as responsible for organising international distribution in shipper companies. A disadvantage of using the IFW list as a sample source is that it was not possible to know beforehand which firms send goods to the relevant countries by the relevant modes.

It was decided to constrain the names in the IFW list in a number of ways.

a) Constraint by status

The mailing list is classified by nature of employment. The sample was restricted to managers with shipping responsibility, or shipping/transport managers.

b) Constraint by firm size

The sample was restricted to firms with 200 or more employees. There was a large number of smaller firms and it was considered that many would be unlikely to export to more than one country and would therefore be unsuitable for the research design.

c) Constraint by industry

Since firms were sought which were likely to use both air and surface transport it was decided to exclude industry categories which, on the face of it, were obviously surface or air users only. For example, it is unlikely that coal and petroleum products, bricks or cement are normally transported by air. Products unlikely to be transported by surface transport are jewellery and precious metals. The categories selected for the survey were, according to the minimum list heading of the Standard Industrial Classification used on the IFW list, as below:

Minimum List Heading	
271-279	Chemicals and allied industries
331-349	Mechanical engineering
351,353-354	Instrument engineering
361-369	Electrical engineering
390-395,399	Metal goods, not elsewhere specified
411-450	Textiles, leather goods, clothing
491-499	Other manufacturing industries

d) Constraint by geographical zone

The destination country constraint has already been discussed in chapter six. It was not possible to identify destination countries to which exporters send goods from the IFW list. In order to achieve homogeneity of origin it was considered desirable to restrict the geographical zone of origin to a limited part of the country so that, in terms of international transport, it could be assumed to be a single point of origin. On this basis the geographical zones given below were selected according to the categories provided on the IFW list.

London
E1-E18, N1-N22, NW1-NW11, W2-W14, Middlesex

Counties
Berkshire, Essex, Northants, Oxfordshire, Hampshire

Four English counties which might be assumed to be included are Bedfordshire, Buckinghamshire, Cambridgeshire and Hertfordshire. They were excluded from the sample because they had been used in an earlier survey by the author (Gray 1977) and it was not considered desirable to duplicate contact.

8.1.2 Sample size

It was difficult to determine an appropriate sample size since there are no precedents for the form of analysis used in this research. Taking into account the constraints described above, 609 names were available on the IFW list. An earlier survey by the author (Gray 1977) suggested that approximately 50% of respondents to an initial postal survey would be prepared to give their names and participate in a follow-up survey, and that there would be a response rate to the follow- up survey of more than 80%. The unknown factor would be the population of firms complying with the destination and mode constraints.

A pilot survey was sent to 50 firms in Febuary 1979. Total responses were 12 (24%) of which there were 9 (18%) useful replies. This pilot omitted to ask whether or not respondents sent exports to W. Europe as a question separate from the questions about modal use, otherwise it was the same questionnaire as that shown in appendix A. The 18% useful response rate was disappointing but, in the absence of other evidence, has to be accepted as the proportion of exporters using air and less than full load surface transport to at least two of the eight selected countries. Since it was anticipated that 50% of the useful replies would be prepared to take part in the subsequent detailed survey, the response

rates indicated that about 50 respondants would be obtained for the detailed second survey (ie approximately 50% of 18% of 609).

The first survey was sent in March 1979 (deliberately delayed because of the lorry drivers' strike at the beginning of 1979). The responses shown in table 8.1 include pilot survey responses.

Total sent	600	(100%)
Total replies	228	(38%)
Useful replies	98	(16%)
Prepared to answer subsequent questionaire	70	(12%)

Table 8.1 Response rate to first questionnaire

The inclusion in the main survey of the question of whether or not respondents have exports to W, Europe appeared to increase greatly the overall response rate, although not the useful response rate. The overall response rate is in keeping with other surveys in the area. For example, Gray (1977) obtained a response rate of 45% and Davies and Gray (1980) a rate of 39%. The proportion of useful replies was as anticipated, and a higher proportion of respondents than anticipated were prepared to answer a subsequent questionnaire.

The proportion of respondents claiming no exports to W. Europe appears high. In the survey by Davies and Gray (1980) 9% of respondents had no exports to W. Europe and 27% had limited exports ('limited' defined as less than 10% of export turnover). It is possible that some respondents who were unwilling to answer the rather exacting first questionnaire claimed that they had no exports to W. Europe. Furthermore, although the question referred to exports to W. Europe in general, it is possible that many respondents noticed that the questionnairereferred only to air and surface less than full load consignments and assumed that the question referred to those modes.

53 respondents took part in the second survey of whom 20 provided material for repertory grids. Twenty appears to be an acceptable number of grids to analyse provided that grid respondents are not required to be divided into subgroups for comparative analysis. Sarre (1973) in a study of perceptions of the town of Bath, Leff (in Preiser ed. 1973) in a study of environmental cognitions, Honikman (1971) in a study of the built environment, Wilson and Dover (1975) in a study of preferences for coffee brands, and Fransella (reported in Bannister ed. 1977) in a study of stutterers all used about 20 respondents for grid completion.

As anticipated, the response rate was high (see table 8.2); 45 respondents completed the second questionnaire of whom 17 completed the repertory grids.

Total sent	53	(100%)
(of which 20 included repertory grids)		
Useful replies (without grids)	28	(85%)
Useful replies (with grids)	17	

Table 8.2 Response rate to second questionnaire and repertory grids

The repertory grids were elicited during April 1979 and were sent to respondents with the second questionnaire immediately after elicitation to ensure a continuity in contact. The remaining questionnaires in the second survey were also sent in April 1979. It was considered important to send this survey before the large survey of 1000 shipping managers by Davies and Gray (1980) which took place in May 1979, on the assumption that the latter would have a greater effect on the response rate of the former than vice versa. It is impossible to know whether or not any respondents completed both surveys.

8.1.3 The representativeness of the sample

Since the social-perceptual approach is concerned with the implicit theories of the group of shipping managers, it is necessary that the sample studied is representative of the population of shipping managers. There are no traditional or acceptable measures of what is a representative sample of shipping managers so that it is diificult to establish appropriate criteria. However, the author was involved in a large scale survey of shipping managers by Davies and Gray (1980) concurrent with the research presented here, and it was possible to include a number of questions in both surveys. The measures available for comparison were:

Proportion of time devoted by respondents to export shipping
The involvement of respondents with various work functions
Total annual turnover of respondents' firms
Total annual worldwide number of export consignments
Job titles of respondents

The analysis presented in chapters nine to twelve is at two levels of survey. Chapters nine to eleven analyse 45 respondents who answered the detailed second survey about the parameter services. Chapter twelve analyses the repertory grids of 17 respondents who completed the second stage survey. These two samples are compared with the approximately 400 respondents to the Davies and Gray survey. For the sake of brevity, in the tables in this section the survey by Davies and Gray is referred to as 'SSE' (ie Society of Shipping Executives), the sample of 45 respondents completing the second stage of the survey of this research is referred to as '2nd stage', and the sample of 17 respondents who completed the repertory grids is referred to as 'rep grid'.

Table 8.3 shows the proportion of time that respondents devote to export shipping and it appears that there is little difference between the surveys.

Survey	No. of respondents	Proportion of time to export shipping 0%	up to 25%	26-50%	51-75%	76-100%
SSE	338	3	22	19	25	31
2nd stage	44	0	32	23	16	30
Rep grid	17	0	24	24	24	29

Table 8.3 Proportion of time devoted to export shipping by respondents (as percentage)

Table 8.4 compares the surveys in terms of decision making involvement of respondents with various work functions.

Task	Survey	No. of respondents (100%)	Involvement with work function: I usually make important decisions (%)	I am usually consulted (%)	I am usually not involved (%)
Export shipping	SSE	387	83	13	4
	2nd stage	45	84	16	0
	Rep grid	17	88	12	0
Import shipping	SSE	381	56	17	27
	2nd stage	42	52	26	21
	Rep grid	15	53	27	20
Domestic transport	SSE	384	34	26	40
	2nd stage	42	31	24	45
	Rep grid	15	27	20	53
Warehousing	SSE	378	25	32	44
	2nd stage	40	22	35	42
	Rep grid	15	33	33	33
Stock management	SSE	375	13	19	68
	2nd stage	40	17	25	57
	Rep grid	14	7	21	71
Packing	SSE	381	39	42	19
	2nd stage	41	46	39	15
	Rep grid	15	53	27	20
Order processing	SSE	376	40	31	29
	2nd stage	42	38	29	33
	Rep grid	15	33	27	40
Export invoicing	SSE	386	73	16	11
	2nd stage	44	68	23	9
	Rep grid	16	75	13	13
Export selling	SSE	378	13	31	56
	2nd stage	41	20	20	61
	Rep grid	15	13	40	47
Export sales forecasting	SSE	374	11	22	67
	2nd stage	41	20	20	61
	Rep grid	15	13	20	67
Customer enquiries	SSE	381	29	41	30
	2nd stage	40	40	35	25
	Rep grid	15	33	20	47

Table 8.4 Decision making involvement in various work functions (as percentage)

Again, the surveys used in this research appear reasonably representative.

Table 8.5 compares the surveys in terms of company size as described by total annual worldwide export turnover and number of export consignments.

Total annual export turnover (% of firms)

Survey	No. of respondents (100%)	£½M	£½M-£1M	£1M-£2M	£2M-£5M	£5M-£10M	£10M-£15M	£15M-£20M	£20M-£30M	£30M or more
SSE	346	10	15	12	22	14	4	5	6	10
2nd stage	43	12	16	14	23	12	0	7	3	9
Rep grid	16	0	0	19	25	19	0	13	6	19

Total annual number of export consignments (% of firms)

Survey	No. of respondents (100%)	<100	100-499	500-999	1000-2499	2500-4999	5000-9999	10000 or more
SSE	358	7	28	21	21	11	8	5
2nd stage	43	2	35	21	14	7	12	4
Rep grid	16	0	13	31	19	6	13	19

Table 8.5 Company size in terms of export turnover and no. of consignments

It appears that the sample in the second stage survey is reasonably representative of shipping managers in terms of both measures of company size. However the shipping managers taking part in the repertory grid exercise tend to come from larger companies both in terms of turnover and consignments. This is probably a result of the research design which requires respondents completing repertory grids to have at least four air and four surface route services to W. Europe. It is probable that many smaller companies would not use this range of route-services. Nevertheless, the bias towards larger companies does not appear large.

Table 8.6 shows the job titles of respondents for each survey. In this

Job title	1st stage (%)	2nd stage (%)	Rep grid (%)	Job title		SSE (%)
Shipping	45	42	65	Shipping/distribution/despatch		55
Transport	6	0	0	Transport/operations		3
Sales or admin.	40	40	24	Sales	5.7	33
Purchasing	2	0	0	Commercial	3.1	
Other	7	18	12	Financial	0.5	
				Administration	5.0	
				Export/import	18.8	
				Purchasing		1
				Other		8
No of respondents (100%)	96	45	17			383

Table 8.6 Job titles of respondents

table it is also possible to include the first stage survey since job titles were obtained in that survey. The job titles in the SSE survey were not classified in exactly the same way as the surveys used for the current research, but it is possible to identify close similarities between the proportions of different job titles if several categories in the SSE survey are consolidated under a general 'sales and administration' category. The proportion of shipping managers who have a job title based on the word 'shipping' is higher for the repertory grid sample. Again, this may be because the larger number of route- services associated with larger firms results in the allocation of an employee to a specific 'shipping' role.

From these results it would appear that the survey samples used in the current research are reasonably representative of a cross- section of shipping managers, given that the much larger Davies and Gray survey is an accurate reflection of the population. As stated in chapter six, it is probable that the Davies and Gray survey is somewhat biased towards the more professional shipping manager who is more likely to join the Society of Shipping Executives. The excluded firms are probably small ones representing a small proportion of total traffic flows.

8.2 Framework of analysis

The analysis is in four main stages. Chapter nine analyses technological flow variables related to properties of the product and is concerned primarily with technological data as an indication of modal use. Chapter ten analyses technological flow variables related to properties of the route-service and is concerned primarily with technological flow variables as an indication of the capacity for measurement of the socio-organisational group of shipping managers. Chapter eleven analyses the socio-organisational constraints on shipping managers, particularly influences of the trading and transport channels. Chapter twelve analyses the cognitive structures of individual shipping managers and the relationships are aggregated to form a composite picture. Chapter thirteen consolidates the results of the preceding four chapters to present a model of the implicit theory of the group of shipping managers in keeping with the conceptual model presented inchapter five. The various international transport issues introduced in chapter one are then considered in the light of the results.

Various terms are used throughout the chapters of analysis. For the sake of brevity the term 'air' is used to represent air transport and 'surface' to represent less than full load surface transport. Specific sub-modes are referred to by name. The term 'route-service', which was introduced in chapter seven, is used to represent a service by a mode to a specific destination (eg road groupage to Spain). The term 'transport contact' is used to represent the transport company (freight forwarder, carrier etc) with whom the survey respondent is in direct contact. This unconventional terminology is required to overcome the problem of the imprecise definition of transport companies in international distribution (see chapter six) owing to the wide range of functions which may be undertaken by freight forwarders. Specific categories of transport contact (eg freight forwarder) are referred to when discussing differences between categories.

The tables of results in chapters nine to twelve are presented separately as chapter appendices so that the text of the chapters is not too disjointed owing to the large number of tables.

Route-services are distinguished from each other partly by the country of destination. However, the analysis presented in the following chapters does not attempt to examine differences between countries, other than in terms of distance from the United Kingdom. This is not to assume that analysis by country is not important, but it would be inappropriate for this study which is concerned primarily with perceptions of modes within W. Europe. Analysis by mode and by country would result in very small samples in some categories.

The analysis in the following chapters was undertaken by computer using various subprograms of the Statistical Package for the Social Sciences (SPSS) described in Nie et al (1975). SPSS release 7.2 was used at Cranfield Institute of Technology (on a remote terminal to University of Manchester Regional Computor Centre) and at Plymouth Polytechnic. The two main data files are given in appendix L (analysis of route-services) and appendix M (analysis of respondents).

CHAPTER 9. TECHNOLOGICAL VARIABLES. 1. PROPERTIES OF THE PRODUCT

9.1 Introduction

The objective of this chapter is to examine the nature of modal use for the survey sample. Value-weight ratios based on independent aggregate data are established and compared with the results of the survey data. The relationship between the independent aggregate data and the aggregate data of the survey is examined to see whether or not the survey results appear reasonable. The survey results are then disaggregated to the level of the firm to examine whether or not the variables obtained from the aggregate studies are valid at the level of the firm.

No attempt is made in this chapter to draw general conclusions from the results of the analysis. Such conclusions are reserved for chapter thirteen when the results of the analyses of chapters nine to twelve are consolidated. The analyses are, wherever feasible, based on both parametric and nonparametric statistics. Since we are dealing with a fairly complex social area it is unlikely that correlations of somewhat imprecise measures will be very high. By requiring significance in both parametric and nonparametric statistics it is possible to make stronger assumptions about relationships between variables.

In common with chapter ten, eleven and twelve the tables of analysis are included as a separate chapter appendix.

9.2 Independent data on aggregate demand for international freight transport

Detailed aggregate statistics of the relative use of different modes of international freight transport are published annually by the Department of Trade in its weekly journal 'British Business' (formerly called 'Trade and Industry'). These statistics are used as an independent data base for the analysis in this chapter. The statistics are based on the data given to HM Customs and Excise by all exporters and importers. They give United Kingdom trade by mode of transport (defined as sea, air and 'other') for both exports and imports by weight and value according to selected countries and commodities. The statistics do not give results for commodities broken down by country or vice-versa.

The survey conducted for this thesis is concerned with only eight countries (see chapter six) and with sixteen product categories under SITC (Standard Industrial Trade Classification) headings. However, before considering the products relevant to the survey let us examine export modal use worldwide.

Chapter six has discussed the relative importance of air and surface transport for the survey countries. The current chapter looks at the attributes of products. The dominant attributes which are likely to influence the technological flow of a consignment are assumed to be weight, volume and value since either individually or in combination, they form the basis of most freight rates in international transport. For example, for surface groupage to W. Europe the shipper pays on the

weight unless 100 kg exceeds 0.3 cubic metres, whereas for air transport he normally pays on the weight unless 100 kg exceeds 0.7 cubic metres. Surface transport to W. Europe generally has a single rate for all commodities (sometimes called F.A.K. - freight of all kinds) whereas air transport, to a large extent, has rates based on commodities in which the assumed value of a commodity group plays an important part. At the time of writing there is a growing tendency towards the establishment of F.A.K. rates for air transport on some routes.

In many studies of freight transport flows the goods are classified according to a standard classificatory system such as SIC (Standard Industrial Classification) which was used in the listing from which the sample survey was obtained or, as in the case of international freight transport, SITC. Table 9.1 shows the aggregate value and weight for each product group by sea, air and 'other' according to the 'Trade and Industry' statistics. 'Other' includes Irish land boundary movements, ships, continental shelf production platforms, movement in pipelines, parcel post and a number of other items. For the purposes of this analysis 'other' items are disregarded.

It is possible to establish aggregate 'sea'and 'air' value-weight (v/w) ratios for each SITC heading by dividing the value by the weight for each mode, the results of which are shown in table 9.2. Table 9.2 also shows the air value and weight as a percentage of the combined air and sea values and weights respectively for each SITC heading. This percentage may be considered as the market share of the international market for each commodity category by air (see Smith 1974 for discussion of a similar analysis). It is clear that a single v/w ratio for each product group is fairly meaningless since there is a considerable difference between the v/w ratio for sea movements and for air movements within the same product category. In effect, we are speaking of two separate aggregate groups of products.

Nevertheless, the correlations in table 9.3 show that there is quite a strong correlation between modal market share and the v/w ratio for both air and sea shipments, apart from the air market share based on weight. As might be expected, the relationship is positive for air and negative for sea, suggesting a greater propensity to use air as opposed to sea the greater the v/w ratio of the goods.

Figure 9.1 shows graphically the relationship between the lines of best fit using the least squares method of linear regression for air and sea v/w ratios against air and sea market shares by value. It shows the tendency for air market share to increase and sea market share to decrease with an increase in v/w ratio. A logarithmic transformation of the v/w ratios was made to improve the Pearson's r value of the line of best fit.

The results suggest that the v/w ratio is a useful indicator of potential modal choice at the aggregate level, provided that the 'sea' and 'air' v/w ratios are considered as separate measures. The results of this analysis raise two questions. First, can comparable results be reproduced for the aggregated data obtained by the survey undertaken for this thesis which is based on a considerably smaller sample, and second, are the results relevant to the decision making of

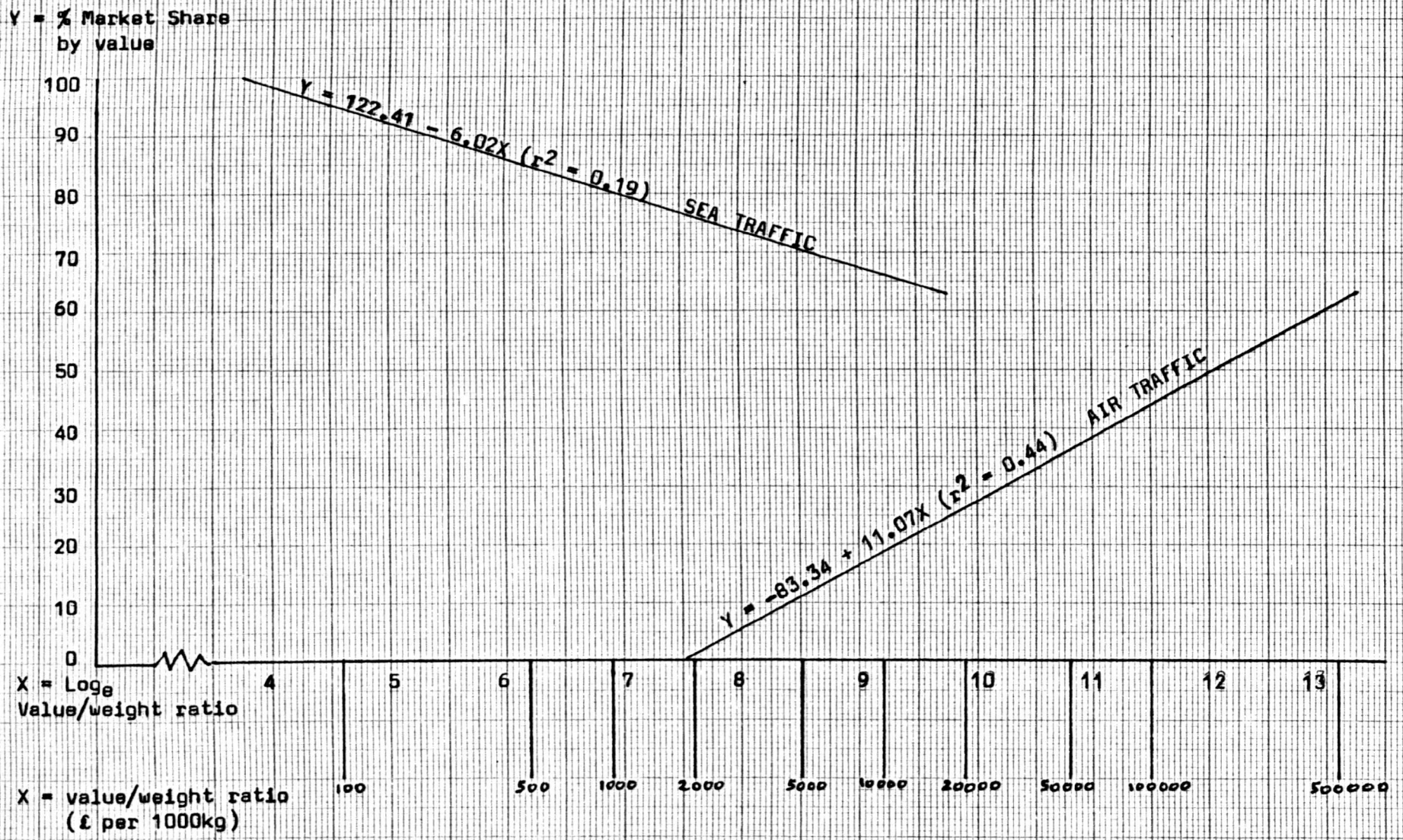


Figure 9.1 Regression lines for air and sea % market share by value on value/weight ratio according to SITC code (Derived from table 9.2. Source: Based on statistics in 'Trade and Industry' 31.8.79)

individual firms? For example, the statistics in 'Trade and Industry' give no indication of whether the aggregate modal split for a given SITC category is a representation of the decisions of individual firms or whether firms predominantly use either air or sea.

9.3 The relationship between independent data and aggregate survey data

Chapter two described how it is possible to make 'cross-level fallacies' which arise when it is assumed that what is valid at one level of aggregation applies to another level. The previous section has shown the existence of a relationship between the v/w ratio and the market share of air and sea transport for product groups at the aggregate level taking into account total trade flows. This section compares those results with the aggregate data of the firms in the survey undertaken for this thesis.

The previous chapter described how the product categories were selected for the survey on the basic of SIC headings. In this chapter the products have been used for the products in the survey are included in the selected commodities of the 'Trade and Industry' statistics, apart from the products of one respondent under SITC heading 64 (paper, paperboard etc). This product group is presumably not sufficiently important as an export category to be included in the 'Trade and Industry' statistics. Table 9.4 shows the aggregate v/w ratio for each of the product groups relevant to this thesis obtained from the 'Trade and Industry' statistics. and extracted from table 9.2. Category 79 is excluded because the 'Trade and Industry' statistics include aircraft for repair, thereby considerably inflating the proportion of goods carried by air for that SITC category. It can be seen from table 9.4 that the overall v/w ratios for the product categories included in the survey are £1374 per 1000 kg for sea transport and £19613 per 100 kg for air transport.

In order to establish data on modal market share and v/w ratios from the survey data comparable with the 'Trade and Industry' statistics it is necessary to examine three sets of data obtained from the survey:

1. V/w ratios as given by survey respondents
2. The estimated total weight of the consignments covered by the survey
3. The estimated total value of the consignments covered by the survey

The first of the three measures was obtained by asking respondents to give an approximate v/w ratio and by establishing whether there was any variability in the v/w ratio between modes and routes. No attempt was made to establish whether there was any different between the v/w ratios of specific consignments on specific routes by specific modes since this was considered too difficult to obtain. Respondents were required to give a separate v/w ratio for each of the possible 154 route-services in the sample. An overall v/w ratio for each respondent was obtained by calculating the mean ratio of each respondent's route-services (maximum of four route-services).

The estimated total weight of the sample was obtained by multiplying the number of consignments for each of the 154 possible routes (for which 45 respondents gave details) by the 'most likely consignment

weight' in tonnes for each route. The estimated total value in £ was obtained by multiplying the value per tonne by the 'most likely consignment weight' in tonnes and multiplying the result by the number of consign ments for each route. The result was then summed for all the routes according to mode. Respondents were not provided with any category values by the researcher against which they could 'anchor' their responses (see operational model in chapter seven).

The results of the three measures of aggregate survey data are given in table 9.5 (modal split by total weight and value) and table 9.6 (value-weight ratios). In a few instances the mode-specific v/w ratios in table 9.6 are based on a mean where different v/w ratios were given for the same mode by the same respondent on different routes. It can be seen that the survey v/w ratios range from a mean £5285 for surface routes to £8597 for air routes, in contrast to the 'Trade and Industry' mean v/w ratios of £1374 (sea) and £19613 (air). Since there is little difference between the air and sea v/w ratios in the survey (Pearson's r = 0.99, Spearman's rho = 0.85 for those respondents with both air and surface movements) further analysis is based on the overall v/w ratio taking all consignments into account.

Figure 9.2 shows that, as a group, the v/w ratios given by the survey respondents are similar to the 'sea' v/w ratios of the 'Trade and Industry' statistics for the same SITC headings (with the exceptions of headings 64 and 79 - see discussion earlier). This suggests that the survey products should be predominantly sea-orientated.

It can be s een from table 9.5 that goods transported by air as a percentage of all goods shipped are 6.5% by weight and 17% by value. The 6.5% market share by weight by air is comparable with the estimated 6.3% market share by weight for air when compared with surface groupage less than 9 tonnes given in chapter six. By the same token one would expect the air % market share by value to be higher than 17%, which is comparable with the overall market share of air for many countries. It is possible that the products typically carried as full loads or in bulk have a lower v/w ratio that those included in the sample so that a higher proportion of weight than value has been excluded from the survey. Furthermore, the inaccura cies inherent in the method of caluclation must also be taken into account.

Despite these limitations it would appear that the aggregate v/w ratio distribution of the sample appears to be related to independent data.

9.4 The relationship between independent data and disaggregate survey data

The previous section has established that there is a relationship between the survey data in aggregate and the independent'Trade and Industry' statistics. This section examines whether or not there is a relationship between the 'Trade and Industry' statistics and the disaggregate survey data. In other words, it examines whether or not the aggregate data are a reflection of patterns of decision making.

Table 9.7 compares the v/w ratio given by respondents in the survey with

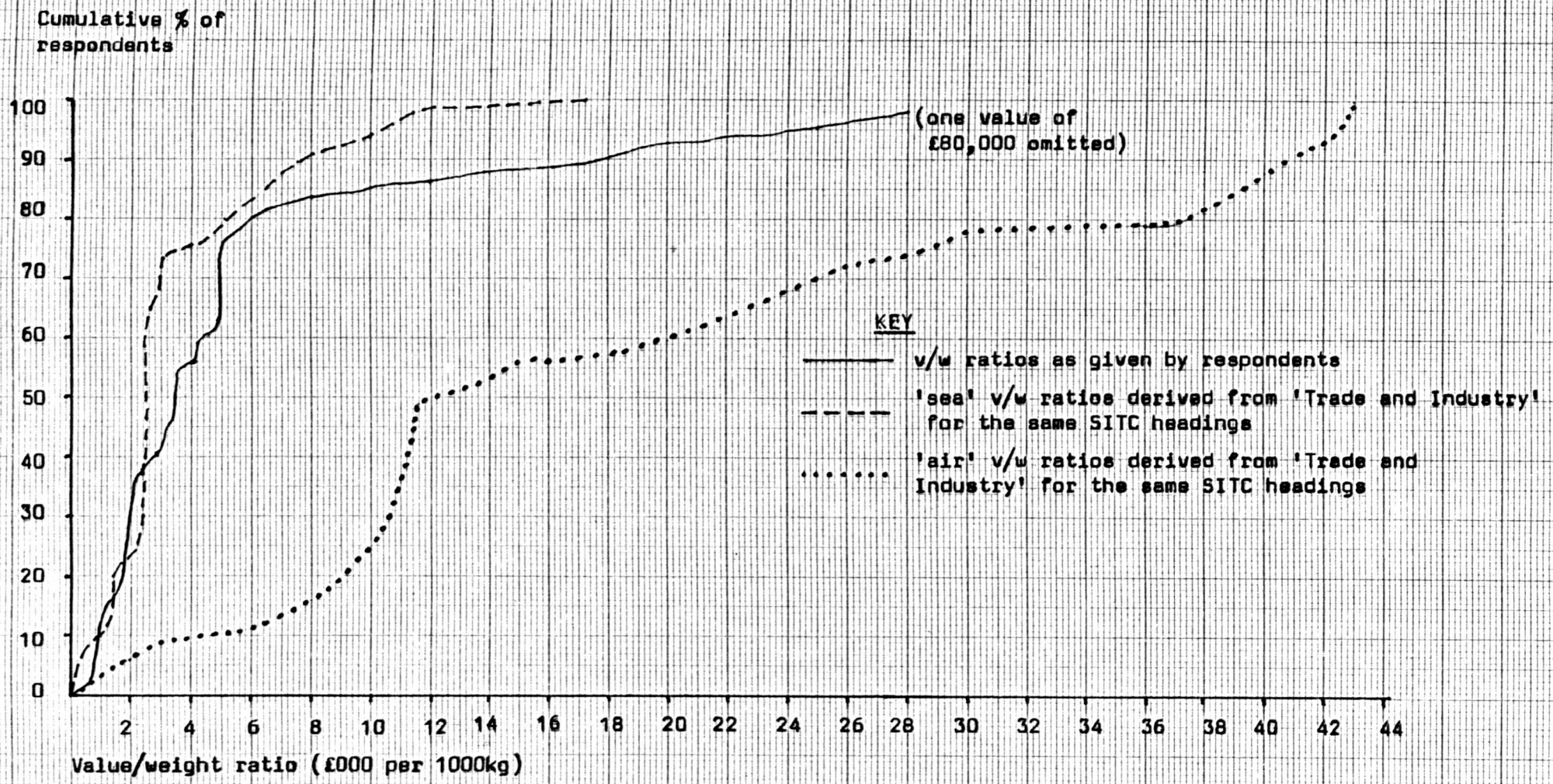


Figure 9.2 Comparison of survey value/weight ratios with those based on 'Trade and Industry' statistics

those of the 'Trade and Industry' statistics for the same SITC headings. There is a significant although low positive correlations with 'air' v/w ratios and no correlation with 'sea' v/w ratios assuming interval-level data. However, the rank-order correlation is moderately strong for both categories. The difference between the product-moment and the rank-order correlations for the 'sea' v/w ratios probably result from the skewed distribution of the survey v/w ratios.

The rank-order correlations in table 9.7 suggest that there is a relationship between aggregate and disaggregate v/w ratios. Evidence of modal use related to v/w ratios at the level of the firm may imply the existence of a normative 'technological' rationality. This aspect is examined further in the following section.

9.5 The consignment approach to freight modal choice

Chapter six described the likely importance of the number of consignments as an indicator of freight modal choice. In chapter two Bayliss (1971) describes the consignment approach as one which concerns actual behaviour in terms of the flow of consignments, and the concept of a consignment as the unit of analysis is used in some examples of the technological positivist approach to freight modal choice. Chapter two described how most freight modal choice models operate within a simple utility maximising framework in the sense that a single decision maker, or the single view of a consensus of decision makers, is assumed to be based on a binary choice between modes. The consignment may be considered as a decision unit in that each consignment is based on a rational decision to use a specific mode. To what extent is the decision to send a consignment by a particular mode based on the intrinsic qualities of goods in terms of the value-weight ratio?

Table 9.8 suggests that consignment weight is clearly related to the mode. It can be seen that the mean 'most likely' consignment weight is much higher for surface than for air transport although there is a degree of overlapping between the mean heaviest air consignment and the mean lightest surface consignment.

However, in terms of number of consignments air transport is relatively highly used since there is a similar average number of consignments for each mode, (see table 9.9).

Two levels of decision making may be associated with the relationship between consignments and modes. There is the decision to start using a particular mode for a particular route-service (for a particular country in the context of this work) and, second, there is the decision which is made each time a consignment is sent along a route where the use of that mode is already established. In the terminology of organisational buyer behaviour (see chapter three) the former may be considered a 'new task' and the latter a 'straight rebuy' (Robinson and Faris 1967).

9.5.1 Modal choice as a 'straight rebuy'

This section examines the relative use of modes in terms of 'straight

rebuys' and the following section considers the use of a mode as a 'new task' as defined in the previous section.

It would be of little value to examine the absolute levels of consignments sent by each mode by each respondent since the absolute level depends on a number of variables extraneous to any transport decision (eg volume of business). A sensible indicator of the propensity to use a particular mode would appear to be the relative use of air and surface transport in terms of consignments. Since each respondent was required to provide data for only a limited number of route-services (a maximum of four), a simple measure of modal preference was established by dividing the mean number of air consignments for a single respondent by the mean number of surface consignments. Thus assuming that the given data are representative of each respondent's total pattern of consignments for W. Europe, a measure of 1.00 would mean that the respondent has the same propensity to use air as surface transport in terms of numbers of consignments.

It should be emphasised that we are not comparing modes over specific routes, but rather it is assumed that the pattern of consignments provided in the survey is representative of the traffic to all eight countries which are treated as a single zone. The validity of this assumption is considered in the following chapter.

The range of values was from 0.031 to 2.667 and the higher the value, the greater the assumed propensity to use air. However, twelve respondents gave no data on air consignments and six respondents gave no data on surface consignments and were excluded from the above range of values. In such instances it was decided to give those with only surface consignment data a value of 0.001 below the lowest value (ie 0.030), and those with only air consignment data a value of 0.001 above the highest value (ie 2.668). In other words, for the purposes of further analysis they are assumed to occupy a position just to the extreme of respondents who use both modes but predominantly only one mode. In order to make explicit any distortions caused by the above assumption the subsequent analysis is based both on the sample of only those respondents who gave data for both modes and on the entire sample of respondents. The simplified distribution of the propensity to use air is shown in table 9.10.

Table 9.11 examines whether or not there is any relationship between the propensity to use air and the intrinsic properties of goods (v/w ratio) based on both the survey data and the 'Trade and Industry' statistics.

The frequency distribution ofthe v/w ratios obtainedin the survey and given in table 9.6 (all consignments) is skewed as a result of the very high values of a few respondents. In order to provide a more sensitive analysis three levels of the survey v/w ratio are examined. The first level includes all v/w ratios, the second level includes all v/w ratios apart from the highest ratio of £80,000 per 1000 kg, and the third level includes all values less than and including £9333 per 1000 kg. From observation of the frequency distribution in table 9.6 (all consignments) it would appear reasonable to examine these three levels since there is a large difference between the highest value in each of the two lower levels and the lowest excluded value. There is a positive correlation between the survey v/w ratio and the

propensity to use air although the correlation declines when the higher v/w ratios are removed.

There is a moderate positive correlation between the propensity to use air and the 'Trade and Industry' v/w ratios in table 9.11, and between the propensity to use air (excluding single-mode respondents) and the 'Trade and Industry' percentage of market share for air.

The propensity to use air which includes single-mode respondents has a large propotion of tied values and it is therefore sensible to examine only the rank-order correlation based on Kendall's coefficient of concordance (tau). The correlations for this measure are not so strong, possibly as a result of the high number of tied values.

The measures presented in this section give a general indications of relationships. It is evident that there is an apparent positive relationship between the intrinsic properties of goods (v/w ratio) and the 'straight rebuy' decision making associated with modal choice in the context of this thesis.

9.5.2 Modal choice as a 'new task'

The 'new task' form of modal choice is assumed to take place when a consignment is sent by a mode to a specific country for the first time. The 'first time' may of course have occurred at any time in the past. Owing to the difficulty of obtaining such data, the survey was restricted to the 12 months preceding the survey date. It is assumed that this provides a reasonably accurate frequency of 'new modes' since the search procedures associated with the purchase of new products may be assumed to be required where there is an extensive period (say, more than one year) between consignments. Table 9.12 gives the frequencies of the numbers of countries used by the respondents for each mode from the eight countries in the survey.

Table 9.13 shows a significant although very small positive correlation between the survey v/w ratios and the number of countries for which air services are used, whereas there is no correlation with the number of countries for which surface services are used. The measure of correlation is restricted to Kendall's coefficient of concordance (tau) since there is a high number of tied values in table 9.12.

9.6 General conclusions

This chapter has established evidence of an influence on freight modal use in terms of the value-weight ratio. It would appear that aggregrate freight modal choice by value is related to the aggregate value-weight ratio (table 9. 3), and that aggregate value-weight ratios have a positive relationship with the value-weight ratios of the survey sample when goods under the same SITC headings are compared (table 9.7). There is also evidence that the modal use of individual firms expressed as the propensity to use air freight is related to the value-weight ratio (table 9.11). In short, this chapter has indicated that the value-weight is a normative influence, clearly recognisable in aggregate data, on modal choice decion making at the level of the firm.

Figure 9.2 and table 9.5 suggest that the group of products in the survey sample are basically surface-orientated and table 9.13 gives an indication that value-weight ratio will influence the extent to which the shipper deviates from his usual surface transport to employ air transport.

These results will be considered in the wider context of the social perceptual approach to freight modal choice in chapter thirteen.

UK trade by mode of transport: exports of selected commodities by value 1978

£ million

SITC		Sea	Air	Other	Total
00 and 94	Live animals	51	42	41	134
04	Cereals and cereal preparations	355	—	10	365
11	Beverages	797	5	3	805
21	Hides and skins	120	37	4	161
27	Crude fertilisers and minerals	132	2	6	139
28	Metalliferous ores and scrap	186	6	—	193
33	Petroleum and petroleum products	2 225	1	10	2 235
51	Organic chemicals	823	82	9	914
52	Inorganic chemicals	520	37	3	561
54	Medicinal and pharmaceutical products	406	237	11	655
55	Essential oils and perfumes	363	14	5	382
58	Plastic materials etc	618	9	21	648
59	Chemical materials and products n.e.s.	578	20	6	605
61	Leather and leather manufactures	116	70	2	188
62	Rubber manufactures	317	13	10	340
65	Textile yarn etc	1 054	117	68	1 238
66	Non-metallic mineral manufactures	524	2 209	390	3 123
67	Iron and steel	1 073	5	28	1 106
68	Non-ferrous metals	695	133	7	835
69	Metal manufactures n.e.s	1 278	150	42	1 471
71	Power generating machinery and equipment	1 261	501	7	1 769
72	Machinery specialised for particular industries	1 906	200	64	2 169
73	Metalworking machinery	348	34	4	386
74	General industrial machinery	1 644	175	21	1 839
75	Office machines and ADP equipment	621	295	3	919
76	Telecomms and sound recording	435	300	6	742
77	Electrical machinery, apparatus and appliances etc	1 017	364	19	1 400
78	Road vehicles	2 953	95	22	3 070
79	Other transport equipment	185	915	370	1 470
84	Clothing	422	224	25	670
85	Footwear	71	18	9	98
87	Professional, scientific and controlling instruments	305	381	3	690
88	Photographic apparatus, optical goods, watches and clocks	268	140	2	410
89	Miscellaneous manufactures n.e.s	931	422	25	1 377
	All other countries	3 248	94	916	4 256
	Total	27 846	7 347	2 170	37 363

UK trade by mode of transport: exports of selected commodities by weight 1978

Thousand tonnes

SITC		Sea	Air	Other	Total
00 and 94	Live animals	35	8	54	98
04	Cereals and cereal preparations	2 739	—	46	2 785
11	Beverages	806	5	4	815
21	Hides and skins	67	1	6	74
27	Crude fertilisers and minerals	10 180	—	96	10 276
28	Metalliferous ores and scrap	1 736	—	6	1 742
33	Petroleum and petroleum products	37 076	1	105	37 183
51	Organic chemicals	2 336	2	22	2 360
52	Inorganic chemicals	1 233	1	20	1 254
54	Medicinal and pharmaceutical products	86	8	3	97
55	Essential oils and perfumes	358	3	7	367
58	Plastic materials etc	873	3	37	913
59	Chemical materials and products n.e.s	799	3	12	814
61	Leather and leather manufactures	20	2	1	23
62	Rubber manufactures	238	2	11	252
65	Textile yarn etc	392	13	36	441
66	Non-metallic mineral manufactures	2 886	4	195	3 086
67	Iron and steel	4 463	3	120	4 586
68	Non-ferrous metals	585	2	7	594
69	Metal manufactures n.e.s.	923	10	53	987
71	Power generating machinery and equipment	401	13	3	416
72	Machinery specialised for particular industries	793	18	49	860
73	Metalworking machinery	145	2	2	149
74	General industrial machinery	548	17	11	576
75	Office machines and ADP equipment	36	8	—	44
76	Telecomms and sound recording	70	7	2	79
77	Electrical machinery apparatus and appliances etc	415	14	10	439
78	Road vehicles	1 554	19	19	1 591
79	Other transport equipment	42	32	—	75
84	Clothing	37	12	3	52
85	Footwear	12	2	2	16
87	Professional, scientific and controlling instruments	29	9	—	39
88	Photographic apparatus, optical goods, watches and clocks	44	5	—	50
89	Miscellaneous manufactures n.e.s	364	36	16	416
	All other commodities	8 633	31	524	9 183
	Total	80 954	297	1 482	82 732

Table 9.1 UK Exports by Mode of Transport by Value and Weight 1978

Source: "Trade and Industry" 31.8.79

SITC CODE	AIR V/W RATIO (£ per 1000 kg)	SEA V/W RATIO (£ per 1000 kg)	AIR MARKET SHARE BY WEIGHT (%)	AIR MARKET SHARE BY VALUE (%)
00/94	4667	1457	20	45
04	-	130	0	0
11	1000	989	1	1
21	37000	1791	1	24
27	-	13	0	1
28	-	107	0	3
33	1000	60	0	0
51	41000	352	0	9
52	37000	422	0	7
54	29625	4721	9	37
55	4667	1014	1	4
58	3000	708	0	1
59	6667	723	0	3
61	35000	5800	9	38
62	6500	1332	1	4
65	9000	2689	3	10
66	552250	182	0	81
67	1667	240	0	0
68	66500	1188	0	16
69	15000	1385	1	11
71	38538	3145	3	28
72	11111	2404	2	9
73	17000	2400	1	9
74	10294	3000	3	10
75	36875	17250	18	32
76	42857	6214	9	41
77	26000	2451	3	26
78	5000	1900	1	3
79	28594	4405	43	83
84	18667	11405	24	35
85	9000	5917	14	20
87	42333	10517	24	56
88	28000	6091	10	34
89	11722	2558	9	31

Table 9.2 Value-weight ratios for SITC product classifications carried by air and sea and percentage air market share by weight and value

Source: Based on statistics in "Trade and Industry" 31.8.79

	Weight of goods sent by air as % of weight of goods sent by air and sea	Value of goods sent by air as % of value of goods sent by air and sea
Value-weight ratio of goods sent by air (£ per 1000kg)	r= -0.09 (0.31) N = 31	r = 0.55 (0.0007) N = 31

	Weight of goods sent by sea as % of weight of goods sent by air and sea	Value of goods sent by sea as % of value of goods sent by air and sea
Value-weight ratio of goods sent by sea (£ per 1000kg)	r = -0.64 (0.00002) N = 34	r = -0.44 (0.005) N = 34

Notes: r = Pearsons product-moment correlation
Significance level given in parentheses (ie 0.01 means relationship has probability of occurring by chance 1% of the time)
N = no. of SITC codes for which statistics available

Table 9.3 Correlations between value-weight ratios and modal market share according to SITC codes

(Source: Based on statistics in "Trade and Industry" 31.8.79)

SITC CODE	AIR V/W RATIO (£ per 1000 kg)	SEA V/W RATIO (£ per 1000kg)	AIR MARKET SHARE BY WEIGHT (%)	AIR MARKET SHARE BY VALUE (%)
54	29625	4721	9	37
58	3000	708	0	1
62	6500	1332	1	4
65	9000	2689	3	10
67	1667	240	0	0
69	15000	1385	1	11
71	38538	3145	3	28
72	11111	2404	2	9
74	10294	3000	3	10
75	36875	17250	18	32
76	42857	6214	9	41
77	26000	2451	3	26
84	18667	11405	24	35
87	42333	10517	24	56
89	11722	2558	9	31
Total of above codes	19613	1374	1.8	20.3

Table 9.4 Value-weight ratios for goods carried by sea and air and percentage air market share by weight and value for SITC categories of respondents in survey.

(Source: Based on statistics in "Trade and Industry" 31.8.79)

	AIR		SURFACE		TOTAL	
	Frequency*	£	Frequency*	£	Frequency*	£
Estimated total value in £	54	2994640 (17.0%)	66	14574161 (83.0%)	120	17568797 (100.0%)
Estimated total weight in tonnes	62	205.8 (6.5%)	68	2973 (93.5%)	130	3178.8 (100.0%)

*"Frequency" refers to frequency of a service. A service is a destination-specific series of consignments for which a respondent gave details.

Table 9.5 Aggregate modal split by value and weight of survey respondents

ALL CONSIGNMENTS

V/W ratio (£ per 1000 kg)	Respondent Frequency	Cumulative %	V/w ratio (£ per 1000 kg)	Respondent Frequency	Cumulative %	V/w ratio (£ per 1000 kg)	Respondent Frequency	Cumulative %
855	1	2	2500	3	39	5000	5	76
900	1	5	3000	1	41	6000	2	80
1000	2	10	3100	1	44	7500	1	83
1054	1	12	3250	1	46	9333	1	85
1400	1	15	3500	3	54	15000	1	88
1500	1	17	4167	1	56	20000	2	93
1650	1	20	4200	1	59	25000	1	95
2000	4	29	4500	1	61	28000	1	98
2200	1	32	4875	1	63	80000	1	100

Mean £7475 per 1000kg Median £3500 per 1000kg

AIR CONSIGNMENTS ONLY

V/w ratio (£ per 1000kg)	Respondent Frequency	Cumulative %	V/w ratio (£ per 1000 kg)	Respondent Frequency	Cumulative %	V/w ratio (£ per 1000 kg)	Respondent Frequency	Cumulative %
855	1	3	2500	3	40	6000	1	77
900	1	7	3000	1	43	6500	1	80
1000	1	10	3100	1	47	7500	1	83
1500	1	13	3500	1	50	20000	2	90
1650	1	17	4200	1	53	25000	1	93
2000	3	27	4500	1	57	28000	1	97
2200	1	30	5000	5	73	80000	1	100

Mean £8597 per 1000kg Median £3523 per 1000kg

SURFACE CONSIGNMENTS ONLY

V/w ratio (£ per 1000kg)	Respondent Frequency	Cumulative %	V/w ratio (£ per 1000 kg)	Respondent Frequency	Cumulative %	V/w ratio (£ per 1000 kg)	Respondent Frequency	Cumulative %
855	1	3	2200	1	36	6000	2	86
900	1	6	2500	3	44	9333	1	89
1000	2	11	3000	2	50	15000	1	92
1054	1	14	3100	1	53	20000	1	94
1400	1	17	3500	3	61	25000	1	97
1500	2	22	4500	1	64	28000	1	100
1650	1	25	5000	5	78			
2000	3	33	5250	1	81			

Mean £5285 per 1000kg Median £3023 per 1000kg

Table 9.6 Frequency distributions of value-weight ratios obtained in survey

"TRADE AND INDUSTRY" STATISTICS

SURVEY RESULTS	'Air' v/w ratios by SITC heading	'Sea' v/w ratios by SITC heading	% air market share by value
V/w ratios of survey respondents by SITC heading	r = 0.26 (0.05) rho = 0.40 (0.005)	r = 0.09 (0.29) rho = 0.40 (0.005)	r = 0.13 (0.21) rho = 0.24 (0.02)

N = 40 in all instances

Table 9.7 Correlations between value-weight ratios of survey respondents and those derived from "Trade and Industry" statistics for the same SITC headings

	AIR	SURFACE
Mean 'most likely' consignment weight (kg)	86 (SD = 148) N = 65	1798 (SD = 2843) N = 71
Mean lightest consignment weight (kg)		417 (SD = 915) N = 73
Mean heaviest consignment weight (kg)	766 (SD = 1935) N = 64	

NB N = no. of route-services (from 154 route-services used by 45 respondents)

Table 9.8 Consignment weights by mode

	Mean number of consignments per annum per route-service
By air	22.1 (SD = 27.4) N = 68
By surface	18.2 (SD = 24.5) N = 76

NB N = no. of route-service (from 154 route-services used by 45 respondents)

Table 9.9 Number of consignments by mode

PROPENSITY TO USE AIR	FREQUENCY OF RESPONDENTS	% OF RESPONDENTS	% OF RESPONDENTS EXCLUDING SINGLE-MODE RESPONDENTS
0.030*	12	27.9	
from 0.031 to 1.000	14	32.6	56.0
1.000	3	7.0	12.0
from 1.000 to 2.667	8	18.6	32.0
2.668*	6	14.0	
Total	43	100.1	100.0 (25 respondents)

* 0.030 = respondents who gave not details of air consignments
  2.668 = respondents who gave not details of surface consignments

Table 9.10 Propensity to use air (mean air consignments divided by mean surface consignments by respondent)

	Propensity to use air (including single-mode respondents)		Propensity to use air (excluding single-mode respondents)	
Survey v/w ratios (all values)	r = 0.48 (0.0007)	tau = 0.15 (0.09)	r = 0.73 (0.0001)	rho = 0.47 (0.01)
	N = 41		N = 24	
Survey v/w ratios (less than or equal to £28000 per 1000 kg)	r = 0.40 (0.005)	tau = 0.11 (0.17)	r = 0.62 (0.0008)	rho = 0.40 (0.03)
	N = 40		N = 23	
Survey v/w rations (less than or equal to £9333 per 1000 kg)	r = 0.12 (0.24)	tau = -0.02 (0.44)	r = 0.19 (0.21)	rho = 0.15 (0.26)
	N = 35		N = 20	
"Trade and Industry" air % market share by value	r = 0.21 (0.09)	tau = 0.11 (0.16)	r = 0.42 (0.02)	rho = 0.28 (0.10)
	N = 43		N = 24	
"Trade and Industry" 'sea' v/w ration	r = 0.32 (0.02)	tau = 0.16 (0.08)	r = 0.30 (0.08)	rho = 0.46 (0.01)
	N = 43		N = 24	
"Trade and Industry" 'air' v/w ratio	r = 0.33 (0.02)	tau = 0.17 (0.07)	r = 0.52 (0.005)	rho = 0.37 (0.04)
	N = 43		N = 24	

NB Kendall's tau is used in place of Spearman's rho as a measure of non-parametric correlation where there is a significant number of tied values.

Table 9.11 Correlation between the propensity to use air and v/w ratio by SITC code

No. of countries for which air route-services used			No. of countries for which surface route-services used		
No. of countries	No. of respondents	Cumulative %	No. of countries	No. of respondents	Cumulative %
0	4	9	0	5	11
1	6	22	1	1	13
2	0	22	2	3	20
3	7	38	3	1	22
4	6	51	4	5	33
5	5	62	5	5	44
6	1	64	6	10	67
7	4	73	7	6	80
8	12	100	8	9	100
Mean 4.58			Mean 5.09		
Median 4.42			Median 5.75		

Table 9.12 Number of countries for which modes used by respondent

	No. of countries for which air services used	No. of countries for which surface less-than-full load services used
Survey v/w ratios (all values)	tau = 0.22 (0.03) N = 41	tau = -0.03 (0.40) N = 41
Survey v/w ratios (less than or equal to £28000 per 1000 kg)	tau = 0.19 (0.06) N = 40	tau = 0.02 (0.43) N = 40
Survey v/w ratios (less than or equal to £9333 per 1000 kg)	tau = 0.15 (0.13 N = 35	tau = 0.03 (0.41) N = 35

NB N = no. of respondents

Table 9.13 Rank-order correlations between number of countries for which modes used by respondents and v/w ratios of respondents

CHAPTER 10. TECHNOLOGICAL VARIABLES 2. PROPERTIES OF THE ROUTE-SERVICE

10.1 Introduction

This chapter continues the theme of the previous chapter in examing physical or technological relationships in modal choice. The previous chapter examined properties of the product and the current chapter examines properties of the route-service.

Chapter five which presented the conceptual model made the assumption that the group of shipping managers would extract a number of items from the general technological world of the freight transport system which have the potential for measurement, however imprecise, as a basis on which to apply and form their implicit theories. In common with most studies of freight modal choice it is assumed that time-based factors with a spatial constraint are likely to be among the predominant measures of a transport service. Chapter seven outlined in detail how respondents to the survey were required to give information on transit times and transit distance.

Respondents gave three measurements of total door-to-door transit time in days - the slowest 'most likely' transit time, the fastest 'most likely' transit time and the variability of transit time. The three measurements were obtained by asking respondents to state their own range of most likely door-to-door transit times. The variability of transit time is the range of transit times (ie the slowest transit time minus the fastest transit time, and then plus one day). One of the concepts developed in chapter five was 'discriminability' of the acceptible limits of performance of an object capable of being measured by a relevant social actor and likely to influence his implicit theory of the freight transport system. This chapter examines the discriminability which shipping managers apply to transit times for surface and air transport from the United Kingdom to W. Europe. As a convenient shorthand, in this chapter 'transit time' refers to the perceived total door-to-door transit time.

It seems reasonable to assume that transit times are ultimately influenced by distance, and the chapter examines whether or not distance is likely to influence transit times within the area of the zone used in the study. Chapter seven described how distance should take into account the nodes which are significant to the shipper. Based on preliminary interviews these were assumed to be the point of departure (usually the exporter's premises), the depot or airport in the UK where consolidation takes place, the depot or airport in the destination country where deconsolidation takes place, and the final destination. Seaports were not considered significant for the shipper of the type of commodity under consideration unless they were points of consolidation of the shipper's goods.

Where there is consolidation or transfer of goods there are likely to be both planned and unplanned delays en route. It is not feasible to investigate every aspect of delay and, indeed, from the respondent's perspective it is unlikely that he would be aware of every aspect of delay. However, one aspect of which he might have knowledge is the frequency of departure of the international vehicle from the operator's depot or point of

consolidation. Therefore, this chapter also investigates the influence of the frequency of departure on the transit time.

It should be emphasised that the transit times given in this chapter are the perceptions of respondents and are therefore not necessarily the actual transit times. Miklius and Casavant (1975 - see chapter two) described how perceptions of transit times can differ from actual transit times, sometimes apparently based on preconceived images of modes. There is the possibility that some of the perceptions of transit times in the current study are similarly distorted; however, this assumption is not testable in the context of the empirical constraints of this study. Nevertheless, it may be argued that perceptions of transit times are more important than actual transit times since decisions on transport are more likely to be influenced by such perceptions. In common with the preceding chapter, the analyses in this chapter are, wherever possible, based on both parametric and non-parametric statistics.

In the previous chapter the basic unit of analysis was the 'firm', whereas in this chapter it is the 'route-service', defined as a route and mode used by a respondent (eg road groupage to Spain). The analysis is based on a maximum 154 route-services used by 45 respondents (see chapter eight). This means that the route-services are not independent of each other in terms of survey respondents, since a respondent's perception of one route-service may influence his perception of another route-service. Although it would be preferable to have a control group of respondents, each contributing a single route-service, Such an approach is impracticable in the context of surveys of business firms owing to the difficulty of obtaining sufficient respondents with the required level of homogeneity.

10.2 Analysis of distances

In order to compare transit times between modes it is first necessary to determine whether or not the distributions of distances for each mode are significantly different. Analysis is based on the three stages of distance introduced in chapter six. They are from point of origin to UK depot or airport (the UK delivery distance), from UK depot or airport to continental depot or airport (the international distance), and from continental depot or airport to final destination (the continental delivery distance).

Chapter seven has described how the distances were measured 'as the crow flies' since it was considered that any greater degree of sophistication of measurement was likely to be spurious. Therefore, most distances are underestimations of the actual distance travelled. For the purposes of this study it is not important since we are concerned with the relative aspects of surface and air transport. Where the distance was within one town (eg from depot Hamburg to domicile Hamburg) an arbitrary 10 km was assumed. In the case of London, respondents were asked to state in which part of the London area (eg north-west) the appropriate node was situated to enable a more accurate measurement of distance to be made.

Tables 10.1(a) to 10.1(c) show the frequencies of route-services for

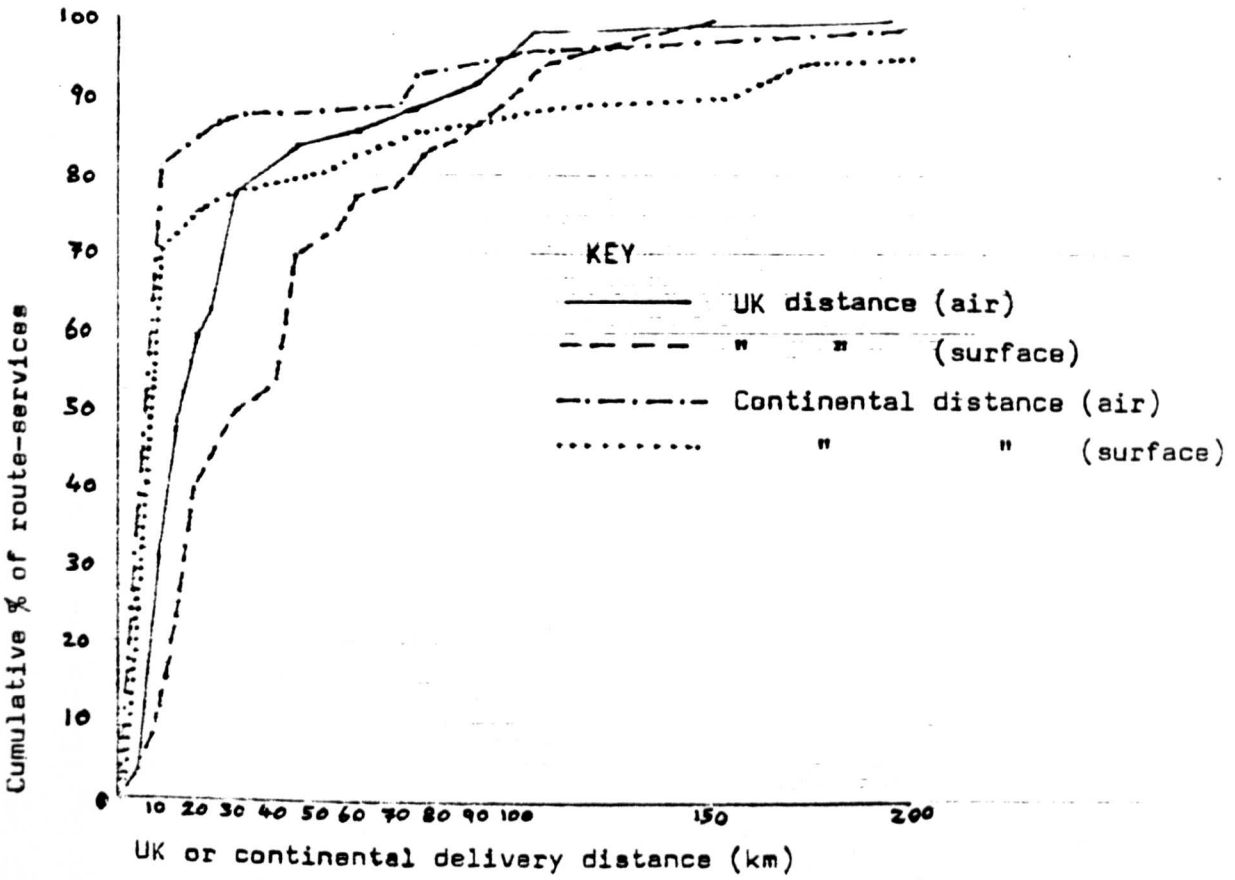


Figure 10.1(a) Cumulative frequencies of UK distances and continental distances (delivery) by mode

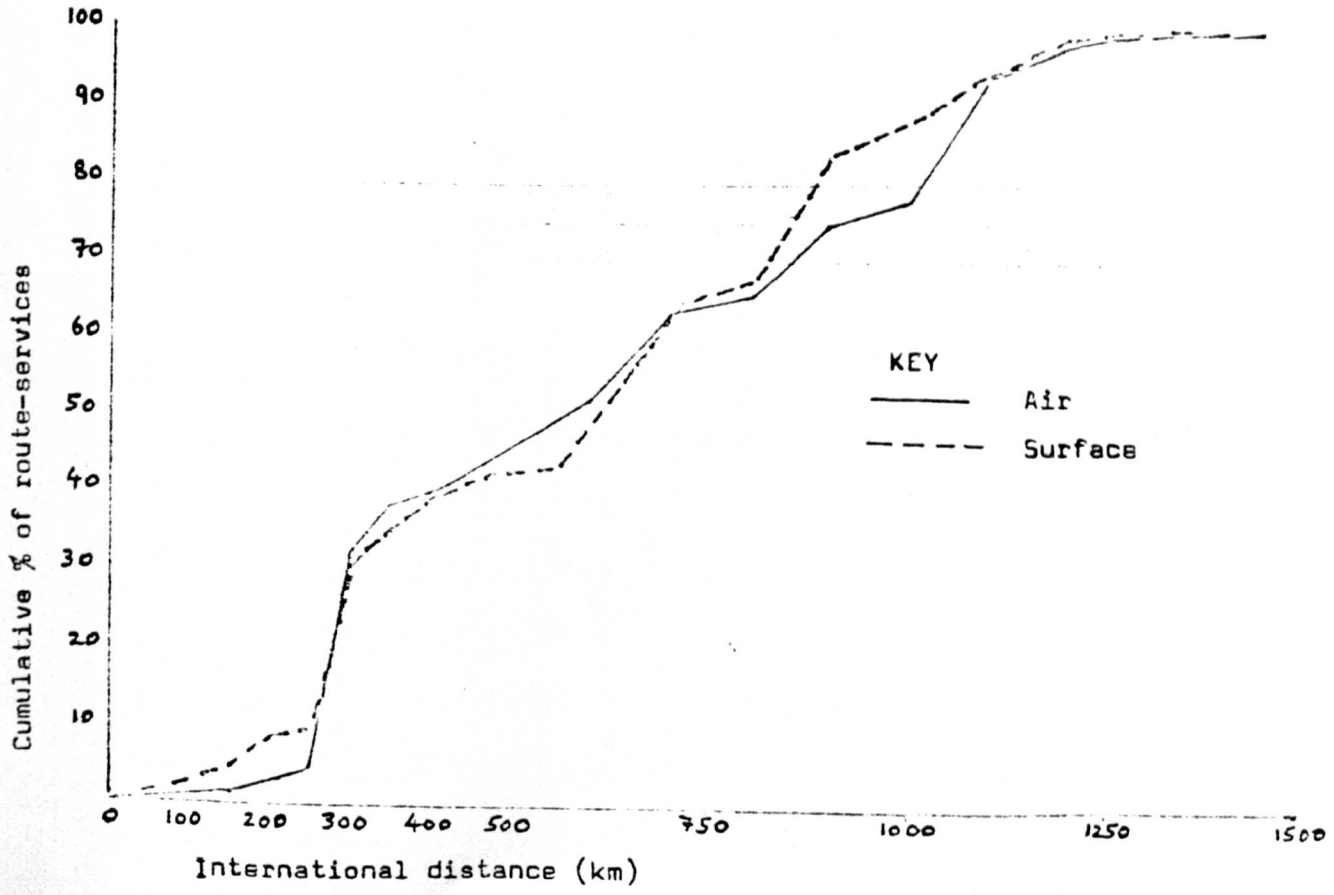


Figure 10.1(b) Cumulative frequencies of international distance by mode

each distance, for both transport modes combined and broken down by mode. Figures 10.1(a) and 10.1(b) show the cumulative frequencies of distance by mode.

Two statistical tests were used to examine whether or not there is any significant difference between the two modes in relation to distance (table 10.2). First, the parametric t-test was used to test whether or not both modes have significantly different means of distances assuming that both samples are from normally distributed populations and, second, the non-parametric Mann-Whitney U test was applied to test whether or not both modes have distances from populations with significantly different medians. It is highly unlikely that the population of distances for the UK and continental delivery distances are normally distributed owing to the likelihood of 'distance decay' (ie the greater the distance the less the volume of flow) (see, for example, Hay 1973). Distance decay is presumably less likely for the international distance which is dependent on trade flows rather than transport mode selection decisions. In the absence of any supporting evidence both statistics are included, although the non-parametric test is probably a more reliable guide.

The results of both tests strongly suggest that there is no significant difference between either the means or the medians of the two transport modes for the international distance. However, there appears to be a significant difference between the means and the medians for the UK delivery distance, where the distance for surface is 46 km (mean and 36 km (median) and for air is 32 km (mean) and 19 km (median).

It is possible that the difference between air and surface for the UK delivery distance is a result of shippers' tendency to find different surface carriers or forwarders for each destination in contrast to their tendency to use a single air forwarder to more than one W. European destination. This aspect will be discussed in detail in the following chapter when considering the transport channel.

10.3 Analysis of transit times (excluding distance)

Before considering the relationship between time and distance for each mode in the following section, this section examines whether or not there is any overall difference between the modes for door-to-door transit times, assuming that both modes have the same 'mix' of destinations. This appears to be a reasonable assumption given that there is no significant difference between international distances for the two modes. The fact that the UK delivery distances are significantly different is overlooked for the time being. In fact, the following section will show that this difference has no bearing on subsequent analysis.

Tables 10.3(a) to 10.3(c) show the frequencies for the slowest and fastest most likely transit times and the variability (range) of transit times for each of the two modes. In all instances the means and medians are lower (ie faster) for air than for the equivalent surface time.

Figure 10.2 shows the cumulative frequencies of transit times by mode. It will be recalled (see chapter seven) that there is no constraint, such as categories provided by the researcher, on respondents in their choice

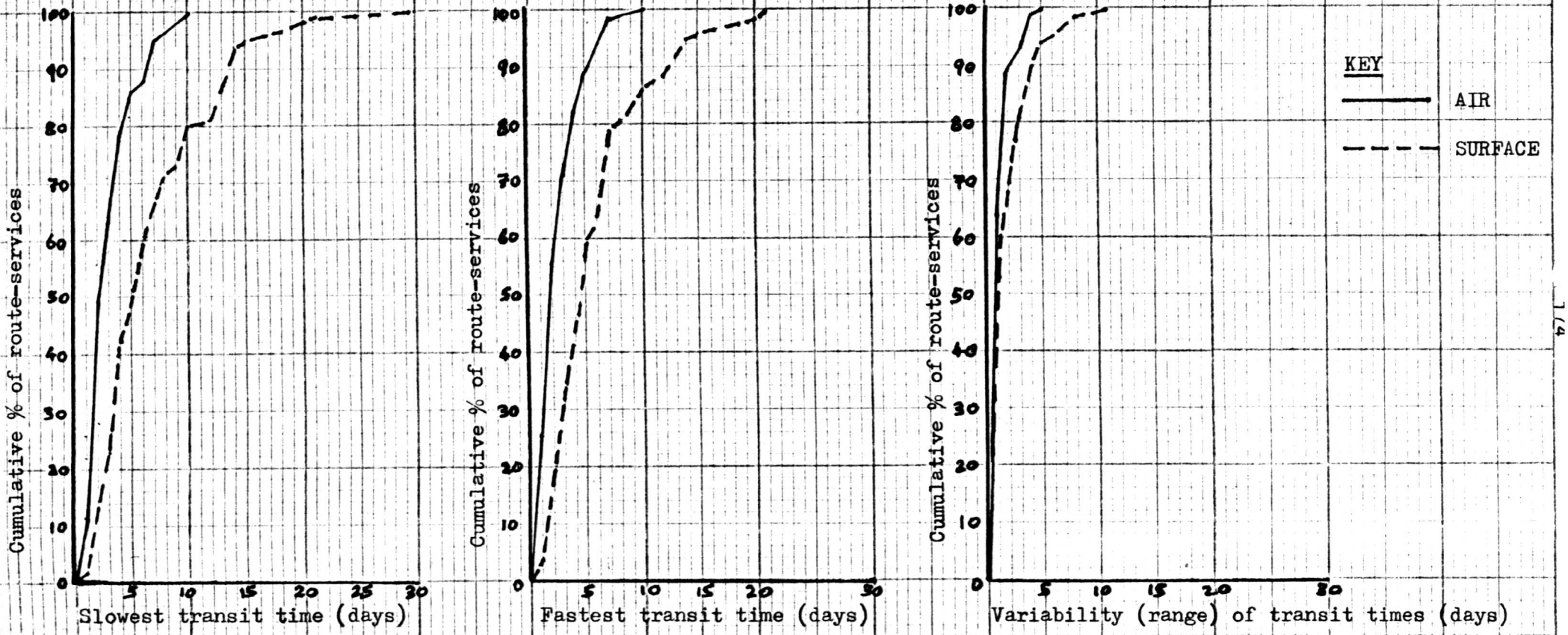


Figure 10.2 Cumulative frequencies of transit times by mode

of transit times other than that they must be in days. However, it is noticeable that a fairly high proportion of respondents gave 7, 10 and 14 days suggesting that some respondents conceive transit times to W. Europe in weekly units (7-day or 5-day).

T-tests and Mann-Whitney U tests were again used to examine whether or not there is any significant difference between the two transport modes. The results in table 10.4 show a significant difference between the means (assuming normality of population distributions) and the medians when comparing the range of transit times for air and surface, and when compairing the fastest most likely surface transit times with the slowest most likely air transit times. Since there is a significant difference between the fastest surface and the slowest air there is no need to compare the modes for other measures of transit time.

Therefore, we may assume that for the route-services in aggregate (or the eight W. European countries taken as a single zone) there is a significant difference between both the absolute transit times and the variability of transit times for the two transport modes. These results do not of course take distance into account and the relationship between transit time and distance is considered in the following section.

10.4 Analysis of transit times related to distance

This section seeks to establish whether or not distance is correlated with transit time and whether or not there is any difference between the two basic modes of air and surface transport.

Table 10.5 gives both parametric and non-parametric correlations for the three measurements of transit times (slowest most likely transit time, fastest most likely transit time, and variability of transit time) against the three distance stages (UK delivery distance, international distance, continental delivery distance) together with their combined total distance by respondent for each transport mode. Table 10.5 shows that there is a moderate positive correlations between both the fastest and the slowest most likely transit times and the international distance for both air and surface, with the correlations somewhat stronger for surface. The variability of transit time is also positively correlated with international distance but only for surface transport. Since there appears to be little difference between the effect of international distance and of total distance, which is not suprising given that the international distance forms a predominant part of the total distance, further analysis regarding transit times is based on the international distance. The delivery distances do not appear to influence transit times significantly and are therefore excluded from the subsequent analysis.

Figure 10.3 shows the least-squares regression of transit time on the international distance for the slowest and fastest most likely transit times for air and surface. The explained variance (r^2) of the lines of best fit given in figure 10.3 is low (ranging from 6% to 15%), and is greater for surface than for air. Transformation of the basic linear equations used in the regression might provide a 'better fit'. However, scatter diagrams produced no obvious non-linear patterns.

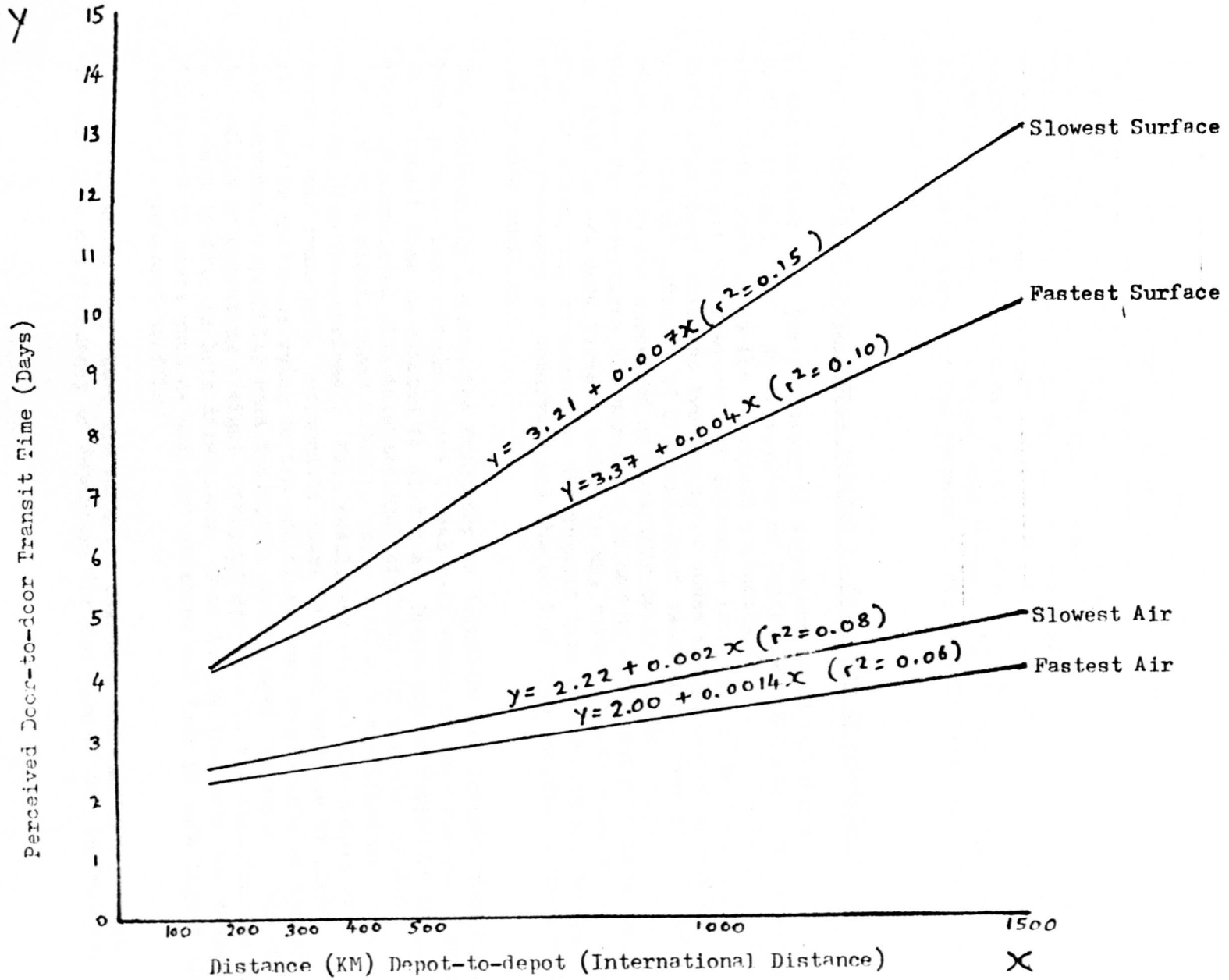


Figure 10.3 Regression of Transit Time on International Distance by Mode

In broad terms it would appear that surface transit times are perceived as being slower than air transit times for international distances, and that the difference between the modes increases with distance. Transit times of both modes appear to increase over distance. The difference between the slowest and the fastest most likely transit times increases with distance for surface transport, but not noticeably for air transport.

A question which arises at this stage is whether or not surface transport is sufficiently homogeneous for this type of analysis, since it encompasses such disparate submodes as express van and rail groupage, whereas air transport in this study is predominantly scheduled air transport. Table 10.6 gives the transit times by submode and shows clearly that the surface transport sample contains the extremes of express van as the fastest submode and rail groupage as the slowest submode, although insufficient numbers of each of these two submodes prevent any form of statistical inference. Table 10.6 also shows how surface transport is dominated by road groupage. If we compare the correlation between time and distance for road groupage with that for all surface transport (see table 10.7) there appears to be little difference. Furthermore, figure 10.4 suggests that the regression of transit time on international distance for road groupage differs only slightly from the regression applied to all surface transport. In the light of these results it would appear reasonable to consider the surface mode as a single mode for the purpose of the transit time analysis undertaken in this chapter.

10.5 Analysis of transit time related to frequency of departure

It was assumed that the frequency of departure would influence the door-to-door transit time. By 'frequency of departure' is meant the frequency with which goods leave the transport contact's depot. In terms of door-to-door transit the frequency of departure is a form of en route delay. Table 10.8 shows that the two transport modes are perceived as having quite different patterns of frequencies of departure. Over 80% of air route-services are perceived as departing daily, whereas nearly 60% of surface route-services are perceived as having a frequency of less than or equal to two departures a week. In the circumstances there is no purpose in attempting to correlate the transit time of air route-services with the frequency of departure and the rest of this section is concerned solely with surface.

The relationship between the frequency of departure and transit time should take distance into account since it has been shown in the previous section that transit time is related to distance. Frequency of departure is quite strongly correlated with international distance for surface transport ($r = 0.51$ with significance 0.00001, tau = 0.42 with significance 0.001, based on 70 route-services). This result may reflect the supply of surface road transport. Presumably there are more services available for shorter distances owing to the organisational constraints on operating services, especially road transport, over longer distances. One of the skills of operating freight transport services is the organisation of a balanced traffic in both directions. Over longer distances the operator's commitment to costs such as drivers' salaries and fuel is much higher where there is unbalanced traffic.

Table 10.9 shows that there are moderate negative correlations between transit time and frequency of departure for the slowest and fastest most

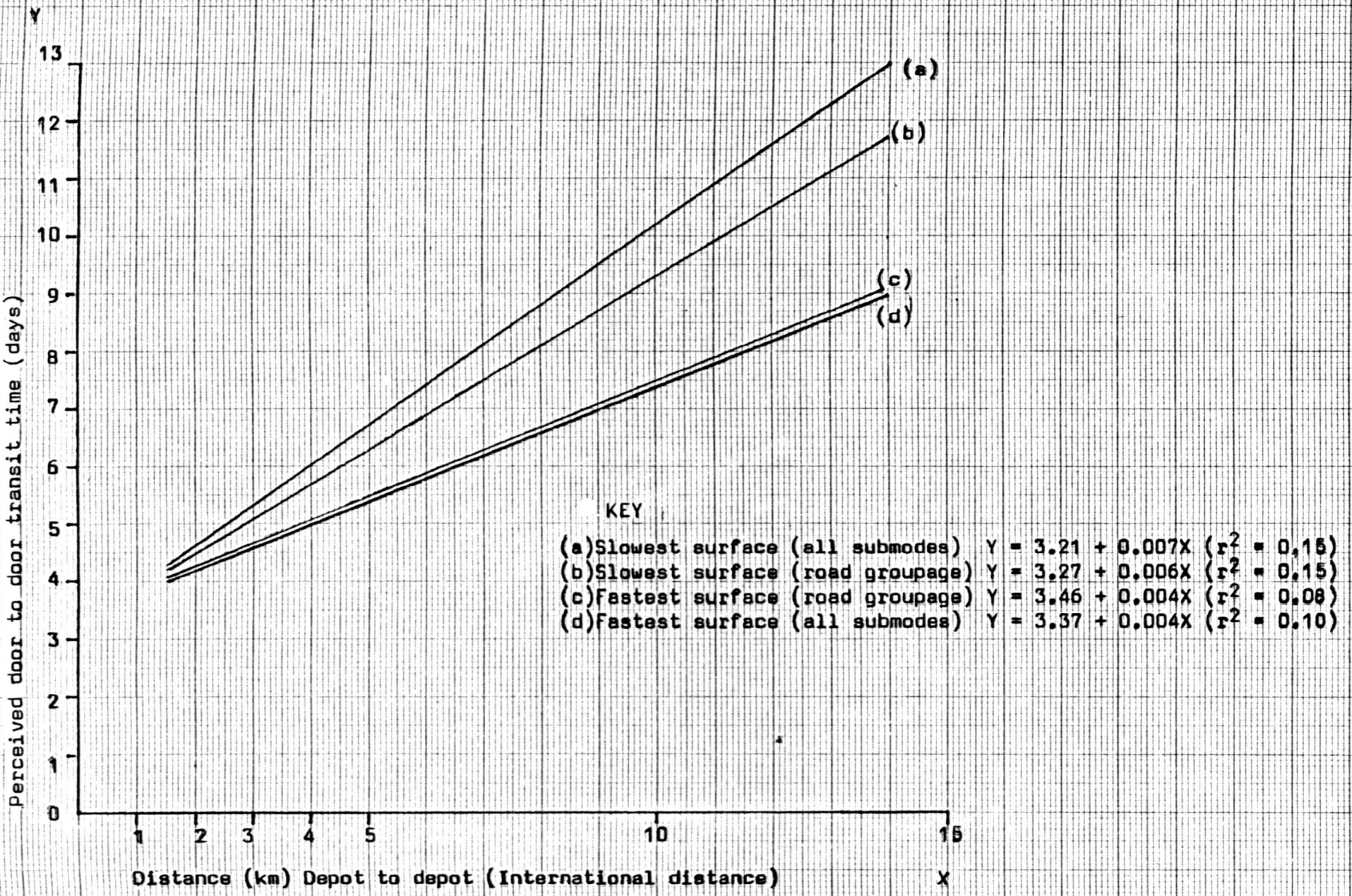


Figure 10.4 Regression of transit times on international distance by surface submode
Comparison of road groupage with all other submodes

likely transit times. However, when the effect of distance is removed from these correlations by means of first order partial correlation it can be seen (table 10.10) that the result of taking international distance into account is to remove the significant correlation between frequency of departure and transit time. The removal of the effect of the UK delivery distance and the continental delivery distance have no impact on the correlations.

Thus, it would appear that, for surface transport, frequency of departure per se does not appear to influence significantly shipping managers' perceptions of transit time. It is only because frequency of departure is positively correlated with international distance that there appears to be some relationship. On the other hand, an outstanding feature of air transport is the much greater perceived frequency of departure than for surface.

This suggests that the frequency of departure may be a much stronger issue in intermodal choice between air and surface transport than in intramodal choice for surface transport.

10.6 Conclusions

The results of this chapter suggest that for the route-services taken as a whole, there is a significant difference between both the absolute transit times and their variability for the two modes. Surface transit time is perceived as being slower than air transit time and the difference between the transit times for the two modes increases with distance. Most air transport is perceived as departing daily, whereas a range of frequencies of departure are given for surface transport. However, the transit time for surface transport does not appear to be related to frequency of departure other than through their common relationship with distance.

APPENDIX TO CHAPTER 10

AIR AND SURFACE COMBINED

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
5	2	1	40	1	65	80	1	86
10	29	21	45	17	76	90	4	89
15	20	34	56	3	78	105	12	97
20	22	49	60	5	81	120	1	97
24	2	50	70	1	82	150	3	99
30	19	63	75	4	85	195	1	100
36	2	64	76	1	85			

Total no. of route-services : 150
Mean 39.4 km St. deviation 35.9 km Median 24.5 km

AIR ONLY

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
5	2	3	24	2	62	75	2	89
10	21	32	30	11	78	90	2	92
15	11	48	45	4	83	105	5	99
20	8	59	60	2	86	195	1	100

Total no. of route-services : 71
Mean 32.0 km St. deviation 34.2 km Median 18.8km

SURFACE ONLY

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
10	8	10	45	13	70	80	1	84
15	9	22	56	3	73	90	2	86
20	14	39	60	3	77	105	7	95
30	8	49	70	1	79	120	1	96
36	2	52	75	2	81	150	3	100
40	1	53	76	1	82			

Total no. of route-services : 79
Mean 46.1 km St. deviation 36.2 km Median 35.8 km

Table 10.1(a) Frequencies of distances from point of origin to UK depot (UK distance)

AIR AND SURFACE COMBINED

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
150	1	1	450	2	41	900	19	79
200	7	5	550	1	42	1000	5	83
250	2	7	600	16	53	1100	15	93
300	35	31	650	2	54	1200	7	98
350	9	37	700	14	64	1250	1	99
400	4	40	800	4	66	1450	2	100

Total no. of route-services : 146
Mean 642.5 km St. deviation 334.0 km Median 612.5 km

AIR ONLY

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
150	1	1	400	1	40	1000	2	78
200	1	3	600	9	53	1100	11	93
250	1	4	700	8	64	1200	3	97
300	20	32	800	1	65	1250	1	99
350	5	39	900	7	75	1450	1	100

Total no. of route-services : 72
Mean 656.3 km St. deviation 345.1 km Median 613.9 km

SURFACE ONLY

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
200	6	8	550	1	43	1000	3	88
250	1	10	600	7	53	1100	4	93
300	15	30	650	2	55	1200	4	99
350	4	35	700	6	64	1450	1	100
400	3	39	800	3	68			
450	2	42	900	12	84			

Total no. of route-services : 74
Mean 629.0 km St. deviation 324.7 km Median 610.7 km

Table 10.1(b) Frequencies of distances from UK depot to continental depot (international distance)

AIR AND SURFACE COMBINED

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
10	104	75	75	5	89	173	1	96
15	3	78	90	2	91	195	1	96
20	3	80	100	1	91	240	1	97
30	3	82	105	1	92	300	1	98
45	2	83	120	1	93	350	1	99
60	2	85	150	1	93	360	1	99
70	1	86	165	2	95	500	1	100

Total no. of route-service : 138
Mean 36.2 km St. deviation 72.7 km Median 10.8 km

AIR ONLY

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
10	56	80	70	1	89	120	1	97
15	2	83	75	3	93	195	1	99
20	1	84	90	1	94	500	1	100
30	2	87	100	1	96			

Total no. of route-services : 70
Mean 28.1 km St. deviation 65.4 km Median 10.6 km

SURFACE ONLY

Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %	Distance(km)	Frequency	Cumulative %
10	48	71	75	2	85	240	1	96
15	1	72	90	1	87	300	1	97
20	2	75	105	1	88	350	1	99
30	1	77	165	1	90	360	1	100
45	2	79	165	2	93			
60	2	82	173	1	94			

Total no. of route-services : 68
Mean 44.5 km St. deviation 79.2 km Median 11.0 km

Table 10.1(c) Frequencies of distances from continental depot to final destination
(continental distance)

		Pooled Variance Estimate T-test			Mann-Whitney U Test			
	No. of cases	Mean	T value	d.f.	2-tailed probability	Mean rank	U	Z	2-tailed probability
UK DELIVERY DISTANCE									
Air	71	32.0	-2.44	148	0.016	62.3	1870.0	-3.55	<0.001
Surface	79	46.1				87.3			
INTERNATIONAL DISTANCE									
Air	72	656.3	0.49	144	0.624	75.2	2545.5	-0.47	0.639
Surface	74	629.1				71.9			
CONTINENTAL DELIVERY DISTANCE									
Air	70	28.1	-1.32	136	0.189	65.9	2130.5	-1.41	0.160
Surface	68	44.5				73.2			

Table 10.2 Tests of difference between distances for each mode

AIR AND SURFACE COMBINED

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	9	6	7	11	80	15	1	97
2	37	30	8	4	82	17	1	98
3	19	43	9	1	83	21	2	99
4	25	59	10	10	90	30	1	100
5	13	67	12	1	90			
6	8	73	14	10	97			

Total no. of route-services : 153
Mean 5.4 days St. deviation 4.6 days Median 4.0 days

AIR ONLY

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	8	11	4	10	78	7	5	95
2	28	49	5	6	86	10	4	100
3	11	64	6	1	88			

Total no. of route-services : 73
Mean 3.4 days St. deviation 2.3 days Median 2.5 days

SURFACE ONLY

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	1	1	7	6	66	15	1	95
2	9	13	8	4	71	17	1	96
3	8	23	9	1	73	21	2	99
4	15	41	10	6	80	30	1	100
5	7	50	12	1	81			
6	7	59	14	10	94			

Total no. of route-services : 80
Mean 7.2 days St. deviation 5.3 days Median 5.5 days

Table 10.3(a) Frequencies of slowest most likely transit times

AIR AND SURFACE COMBINED

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	22	14	6	4	76	14	5	97
2	34	37	7	19	88	15	1	98
3	22	51	8	2	90	20	1	99
4	18	63	10	5	93	21	2	100
5	16	73	12	2	94			

Total no. of route-services : 153
Mean 4.6 days Std. deviation 3.9 days Median 3.4 days

AIR ONLY

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	19	26	4	8	82	10	1	100
2	22	56	5	5	89			
3	11	71	7	7	99			

Total no. of route-services : 73
Mean 2.9 days Std. deviation 2.0 days Median 2.3 days

SURFACE ONLY

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	3	4	6	4	64	14	5	95
2	12	19	7	12	79	15	1	96
3	11	33	8	2	81	20	1	98
4	10	45	10	4	86	21	2	100
5	11	59	12	2	89			

Total no. of route-services : 80
Mean 6.1 days Std. deviation 4.5 days Median 4.9 days

Table 10.3(b) Frequencies of fastest mode likely transit times

AIR AND SURFACE COMBINED

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	90	59	4	11	94	8	3	99
2	29	78	5	4	97	11	1	100
3	14	87	6	1	97			

Total no. of route-services : 153
Mean 1.9 days Std. deviation 1.6 days Median 1.4 days

AIR ONLY

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	47	64	4	4	99
2	18	89	5	1	100
3	3	93			

Total no. of route-services : 73
Mean 1.5 days Std. deviation 0.9 days Median 1.3 days

SURFACE ONLY

Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %	Time (Days)	Frequency	Cumulative %
1	43	54	4	7	90	8	3	99
2	11	68	5	3	94	11	1	100
3	11	81	6	1	95			

Total no. of route-services : 80
Mean 2.3 days * Std. deviation 2.0 days Median 1.4 days

* A result of 2.1 would be anticipated, based on results of tables 10.3(a) and 10.3(b). The difference is caused by rounding the results to one decimal place.

Table 10.3(c) Frequencies of variability (ranges) of transit times

	No. of cases	Separate Variance Estimate T-test: Mean	T value	d.f.	2-tailed probability	Mann-Whitney U Test: Mean rank	U	Z	2-tailed probability
VARIABILITY (RANGE) OF TRANSIT TIMES									
Air	73	1.5	-2.96	113.6	0.004	70.0	2409.5	-2.1	0.036
Surface	80	2.3				83.4			
'MOST LIKELY' TRANSIT TIMES - DIFFERENCE BETWEEN SLOWEST AIR AND FASTEST SURFACE									
Air	73	3.4	-4.78	118.3	<0.001	59.6	1650.5	-4.7	<0.001
Surface	80	6.1				92.9			

NB A separate variance estimate with an approximation to t is used on the assumption that the populations of transit times for both tests have significantly different variances.

Table 10.4 Test of difference between transit times for each mode

	UK Delivery Distance	International Distance	Continental Delivery Distance	Total Distance
AIR TRANSPORT				
Fastest transit time	r = -0.16 (0.09)	r = 0.24 (0.02)	r = -0.16 (0.10)	r = 0.19 (0.06)
	tau = -0.03 (0.36)	tau = 0.22 (0.009)	tau = -0.06 (0.29)	tau = 0.10 (0.12)
	N = 71	N = 72	N = 70	N = 68
Slowest transit time	r = -0.16 (0.09)	r = 0.28 (0.01)	r = -0.18 (0.06)	r = 0.22 (0.03)
	tau = 0.009 (0.46)	tau = 0.25 (0.003)	tau = -0.12 (0.119)	tau = 0.15 (0.05)
	N = 71	N = 72	N = 70	N = 68
Variability (range) of transit times	r = -0.06 (0.29)	r = 0.12 (0.15)	r = -0.13 (0.15)	r = 0.10 (0.21)
	tau = 0.07 (0.26)	tau = 0.06 (0.27)	tau = -0.25 (0.01)	tau = 0.05 (0.31)
	N = 71	N = 72	N = 70	N = 68
SURFACE TRANSPORT				
Fastest transit time	r = -0.21 (0.04)	r = 0.31 (0.004)	r = 0.07 (0.27)	r = 0.32 (0.003)
	tau = -0.05 (0.29)	tau = 0.25 (0.002)	tau = 0.13 (0.09)	tau = 0.29 (0.001)
	N = 78	N = 74	N = 68	N = 66
Slowest transit time	r = -0.17 (0.06)	r = 0.39 (0.0003)	r = 0.12 (0.17)	r = 0.42 (0.0002)
	tau = -0.03 (0.34)	tau = 0.29 (0.001)	tau = 0.16 (0.05)	tau = 0.34 (0.001)
	N = 78	N = 74	N = 68	N = 66
Variability (range) of transit times	r = -0.02 (0.42)	r = 0.32 (0.003)	r = 0.09 (0.21)	r = 0.35 (0.001)
	tau = -0.03 (0.39)	tau = 0.20 (0.04)	tau = 0.02 (0.42)	tau = 0.20 (0.016)
	N = 78	N = 74	N = 68	N = 66

NB One-tailed significance levels (on assumption that transit time increases with distance) given in parenthesis. 'N' refers to number of route-services. 'r' = Pearson's product-moment correlation coefficient and 'tau' = Kendall's rank-order correlation coefficient

Table 10.5 Correlations between Transit Times and Distance

SUBMODE	No. of route services	SLOWEST TRANSIT TIME (days)		FASTEST TRANSIT TIME (days)		VARIABILITY (RANGE) OF TRANSIT TIME (days)	
		Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Road groupage	60	6.9	4.5	5.7	4.0	2.4	1.8
Road part load	14	5.5	2.8	5.1	2.8	1.4	0.8
Express van	3	2.7	1.2	2.0	1.0	1.3	0.6
Rail groupage	5	18.0	7.8	15.2	5.3	3.8	4.4
Scheduled air	66	3.2	2.2	2.8	1.9	1.5	0.9
Other air	5	5.6	3.0	4.6	2.6	2.0	1.2
Total	153	5.4	4.6	4.6	3.9	1.9	1.6

Table 10.6 Perceived door-to-door transit time by submode

	International Distance	
	All Surface	Road Groupage only
Fastest transit time	r = 0.31 (0.004)	r = 0.28 (0.02)
	tau = 0.25 (0.002)	tau = 0.21 (0.02)
	N = 74	N = 53
Slowest transit time	r = 0.39 (0.0003)	r = 0.39 (0.002)
	tau = 0.29 (0.001)	tau = 0.28 (0.004)
	N = 74	N = 53

NB One-tailed significance levels (on assumption that transit time increases with distance) given in parentheses. 'N' refers to number of route-services.

Table 10.7 Correlations between Transit Times and Distance; a Comparison of Road Groupage with all Surface Transport

	FREQUENCY OF DEPARTURE						
	Daily	4 per week	3 per week	2 per week	1 per week	<1 per week	Row Total
Air	50	6	0	1	3	0	60
Surface	11	10	10	25	18	1	75
Column Total	61	16	10	26	21	1	135

Chi square = 68.99 with 5 degrees of freedom Significance <0.0001

Total route-services = 135 (19 missing)

NB Missing observations include 6 route-services where frequency 'varies' (2 air and 4 surface)

Table 10.8 Perceived Frequency of Departure from UK Depot by Mode

	FREQUENCY OF DEPARTURE	
Slowest transit time	r = -0.29 (0.006)	tau = -0.25 (0.003)
Fastest transit time	r = -0.27 (0.01)	tau = 0.26 (0.002)
Variability (range) of transit times	r = -0.17 (0.08)	tau = -0.09 (0.18)

NB One-tailed significance levels given in parentheses (on assumption that transit time decreases with increased frequency of service).

No. of route-services is 74 in all cases.

Table 10.9 Correlations between Perceived Surface Transit Time and Perceived Frequency of Departure from UK Depot

	Zero Order Partials	1st Order Partials controlling for		
	Frequency of Departure	UK delivery distance	International distance	Continental delivery distance
Slowest transit time	r = -0.31 (0.007) N = 63	r = -0.32 (0.006) d.f. = 60	r = -0.12 (0.18) d.f. = 60	f = -0.31 (0.007) d.f. = 60
Fastest transit time	r = -0.25 (0.02) N = 63	r = -0.27 (0.02) d.f. = 60	r = -0.10 (0.22) d.f. = 60	r = -0.26 (0.02) d.f. = 60
Variability (range) of transit times	r = -0.25 (0.02) N = 63	r = -0.25 (0.03) d.f. = 60	r = -0.10 (0.21) d. f. = 60	r = -0.25 (0.02) d.f. = 60

NB One-tailed significance levels (on assumption that transit time decreases with increased frequency of service). 'N' refers to no. of route-services. 'N' differs from table 10.9 to allow uniformity of observations for all partial correlations. Partial non-parametric correlations cannot be made.

Table 10.10 Correlation between Perceived Surface Transit Time and Perceived Frequency of Departure from UK Depot taking Distance into Account

CHAPTER 11. SOCIO-ORGANISATIONAL INFLUENCES

11.1 Introduction

Chapter five, which introduced the conceptual model, has described how the social perceptual approach to freight modal choice is concerned with the implicit theories of different groups of social actors (in the case of this study, with shipping managers). The ability to derive the implicit theory depends partly on the social constraints which influence the standpoint of the 'theoriest'. The nature of potential social constraints has been outlined in chapter six when the topic area was introduced. Such constraints include the influence of the channels of trade and transport which are considered in this chapter. The chapter also investigates the relationship of the individual respondent shipping manager to the channels of trade and transport in terms of his personal decision making authority.

Owing to the non-ordinal nature of most of the data presented in this chapter, most statistical analysis is based on the chi-squared test of association. In common with much social research a significance level of 0.05 is assumed (ie a significant difference between categories of variables will occur by chance in 5% of samples). Most of the analysis is based on route-services and the comments made in section one of the preceding chapter are again valid: that is, that individuals provided information about more than one route-service so that cases are not independent of each other in terms of survey respondents, but are considered independent as route-services . The variability in the number of cases for each analysis depends largely on whether or not the questions on which the analysis was based were in the first or second questionnaire (see chapters seven and eight)

In keeping with the two preceding chapters the discussion of the analysis of each chapter is restricted to the immediate results and the wider implications are reserved for chapter thirteen where the results of the analysis are consolidated.

11.2 The trading channel

11.2.1 Terms of sale

Table 11.1 shows the modal use by terms of sale both separately (table 11.1 a) and for the two trading channel contrasts for the terms of sale described in chapter six (table 11.1b). These are the territorial contrast and the through transport contrast. The results of table 11.1 suggest that there is no statistically significant difference in the use of modes based on the terms of sale in general, although the difference between air and surface transport for 'delivered domicile' consignments in contrast to the other terms of sale is noteworthy. Over 75% of consignments on 'delivered domicle' terms of sale were by surface mode.

Table 11.2 shows that there is a significant relationship between the terms of sale (territorial contrast) and the respondents' awareness of the freight rate. Respondents were asked to enter an actual freight

rate or the words 'not known' rather than simply state whether or not they knew the freight rate, since it was considered that some respondents might be reluctant to admit their lack of knowledge of the freight rate. Only respondents giving either of those responses are included in the analysis (ie it excludes respondents who gave no answer). The results of table 11.2 suggest a significant relationship between the ability to quote the freight rate and the use of c.i.f. and delivered domicile terms of sale for both modes. However, the terms of sale do not appear to be absolute determinants of knowledge of the freight rate since approximately one-third of included route-services are 'wrongly' allocated if this were the case. There appears to be no relationship between the knowledge of freight rates and the through-transport contrast for terms of sale. These results suggest that the terms of sale are a reasonable indicator of channel power in the selection of the transport operator and mode, if we may assume that knowledge of the freight rate indicates control of the selection.

11.2.2 Type of customer

Table 11.3 shows the relationship between the mode of transport and type of customer and, again, there appears to be no significant difference between the transport modes, even after the types of customer are consolidated in the manner proposed in chapter six (section 6.3.1) on the assumption that retailers and wholesalers will follow a different pattern of behaviour from manufacturers and divisions of the exporters' own companies.

11.2.3 Regularity of orders

Table 11.4 shows the extent to which the regularity of orders sent on a route-service are related to the use of mode.

There is a significant difference between the two modes for the type of order with a higher proportion of surface movements having a regularity of more than 75%, whereas a higher proportion of air route-services have a regularity of less than 25%. This would appear to support the evidence in chapter nine that the sample consists predominantly of surface-orientated users, although it should be recalled that air freight is used by the group taken as a whole as frequently as surface transport (see table 9.9 of chapter nine).

11.3 Interrelationship of trading channel variables

Examination of the relationship between the terms of sale and the type of customer shows that there is a significant relationship for the territorial contrast but not for the through-transport contrast(table 11.5a).

Table 11.5a shows that the territorial contrast contains a significantly higher proportion of retailer and wholesaler customers who purchase goods on an ex works or f.o.b. basis in contrast to customers who are manufacturers or a division of the supplier's own company. This may support the assumption in chapter six that retailers and wholesalers are more likely to have a well-established transport service network with the UK and would therefore wish to control the international stage of the total transport.

Therefore they would be reluctant to purchase on a c.i.f. or delivered basis from UK manufacturers. This relationship is examined further in table 11.5b where the pattern is maintained for surface transport, although the difference is not statistically significant for air transport.

Since a statistically significant difference has already been shown between the modes in their relationship to regular, repeat orders, table 11.6 shows the relationship between the terms of sale and the proportion of regular repeat orders broken down by mode only. The only significant result is for air transport when the territorial contrast for terms of sale applies. In this case only a very small proportion of more regular consignments are sent on c.i.f. or delivered domicile terms. This result suggests that continental buyers may be more inclined to use air on a regular basis than British sellers. However, this result does not extend to the type of customer despite the significant relationship between the territorial contrast and the type of customer (see table 11.7).

11.4 The transport channel

This section examines the type of transport contact used for each route-service, the number of transport contacts used within and between route-services and the length of time transport contacts have been used on each route-service in the context of modal use.

11.4.1 Type of transport contact

Table 11.8 examines the relationship between the relative use of freight forwarders and the transport mode. Chapter six has already described the difficulty of precisely classifying the functions of a freight forwarder. This chapter makes the contrast between the use of an intermediate freight forwarder and the direct use of a carrier (eg airline, road haulier, shipping line, railway company). Table 11.8 shows that few users of air transport appear to be directly involved with the carrier which is in sharp contrast to surface transport. 92% of air route-services use a forwarder in contrast to 48% of surface route-services.

Table 11.9 examines the relationship between the size of the operator and the use of mode. It would appear that there is no significant difference between the modes.

11.4.2 Number of transport contacts used within and between route-services

Table 11.10 contrasts the number of transport contacts used on each mode for each route-service, and it can be seen that a significantly higher proportion of route-services employ three or more operators for surface transport (85%) in contrast to air transport (15%).

Table 11.11 shows the combinations of transport contacts according to mode and is subdivided into the different combinations of air and surface route-

services to which each respondent gave answers to the survey. It is evident that respondents are much more likely to use the same air transport contact (table 11.8 shows that for air he is predominantly a freight forwarder) for more than one route-service.

Table 11.12 shows the relationship between the use of modes and the time for which the same transport contact has been used. The results suggest that respondents tend to keep their main transport contact for a longer period for air transport than for surface transport.

11.5 Personal decision making responsibility of the respondent

This section examines the relationship between the personal decision making responsibility of the respondent and the trading and transport channels.

Respondents were asked about four degrees of decision making (alone, a joint decision with colleagues, a joint decision with customers, and not involved) and two levels of decision making (selecting the mode and selecting the transport contact).

Table 11.13 shows the interrelationships between the degrees and levels of decision making. On the assumption that the selection of the mode is a prior decision to the selection of the contact , table 11.13 can be interpreted as showing the sequence of degrees of decision making from the selection of the mode to the selection of the transport contact. It is evident from table 11.13 that there are only five common sequences:

a) Respondent decides along for both the selection of the mode and the transport contact.

2) Selection of the mode is a joint decision between the respondent and others in his company, and the respondent selects the transport contact alone.

3) Both selection of the mode and the transport contact is a joint decision between the respondent and others in his company.

4) The selection of the mode is a joint decision between the respondent and the customer, and the respondent selects the transport contact alone.

5) Both the selection of the mode and the transport contact is a joint decision between the respondent and the customer.

The five dominant patterns of selection may be portrayed as two lines of diminishing autonomy for the respondent (see figure 11.1 on page 197)

Table 11.14 shows no significant difference between the modes for the two lines of diminishing autonomy. Table 11.15 examines the relationship between the lines of diminishing autonomy and the trading and transport channel variables. The results show that there are only three variables which are significant for each of the two lines of diminishing autonomy. All such variables are associated with the trading channel. For the line involving decision making with colleagues the significant variables are whether or not the respondent was able to give the freight rate, the customer type and the extent of

regular, repeat orders. The three significant variables for the line of diminishing autonomy involving decision making with customers were the terms of sale (territorial contrast), whether or not the respondent could give the freight rate, and the type of customer. Detailed statistics for only those variables with statistically significant differences are given in table 11.16 (decision making relationships with customers) and table 11.17 (decision making relationships with others in the respondent's company).

The results shown in table 11.16 (decision making relationships with customers) should be considered in conjunction with the finding (table 11.5) of a significant relationship between the territorial contrast of the terms of sale and the customer type.

Respondents are more likely to be involved as the sole decision maker when the terms of sale are c.i.f. or delivered domicile, or when the customer is a manufacturer or a division of the respondent's own company.

The results in table 11.17 (decision making relationships with colleagues) suggest that the person who knows the freight rate may be located elsewhere in the same company in many cases when the decision making responsibility is held jointly with colleagues. Unfortunately the survey results do not reveal whether or not such colleagues hold a subordinate or superordinate position to the respondents. Gray and Davies (1981) have shown that transport decision making extends in both directions from the shipping manager, although usually it does not extend to someone in a subordinate post.

It is difficult to understand the meaning of the statistically significant difference shown in table 11.17 between the types of customer for air transport in the decision making relationships with colleagues, and if there is any substantive significance the variables used do not identify it. The relationship between the degree of regularity of orders and the decision making relationship with colleagues indicates that colleagues are more likely to be involved both in the selection of the mode and of the transport contact when there is a higher proportion of regular, repeat orders. Although the result is significant only for the combined modes, the cell percentages suggest that the lack of significance for the modes considered separately is possibly the result of insufficient numbers in each cell.

11.6 Conclusion

This chapter has examined the relationships between channel variables and modal use based on two classes of channel - the trading channel and the transport channel.

The results given in this chapter suggest that a number of channel variables are interrelated. The territorial contrast of the terms of sale (ex works and f.o.b. versus c.i.f. and delivered domicile) appears to be related to the type of customer (table 11.5), in that retailers and wholesalers are more inclined to purchase goods on ex works and f.o.b. terms, in contrast to manufacturers or divisions of the respondents' own companies where a higher proportion of sales are c.i.f. or delivered domicile. This result suggests that retailers and wholesalers are more concerned with controlling the international

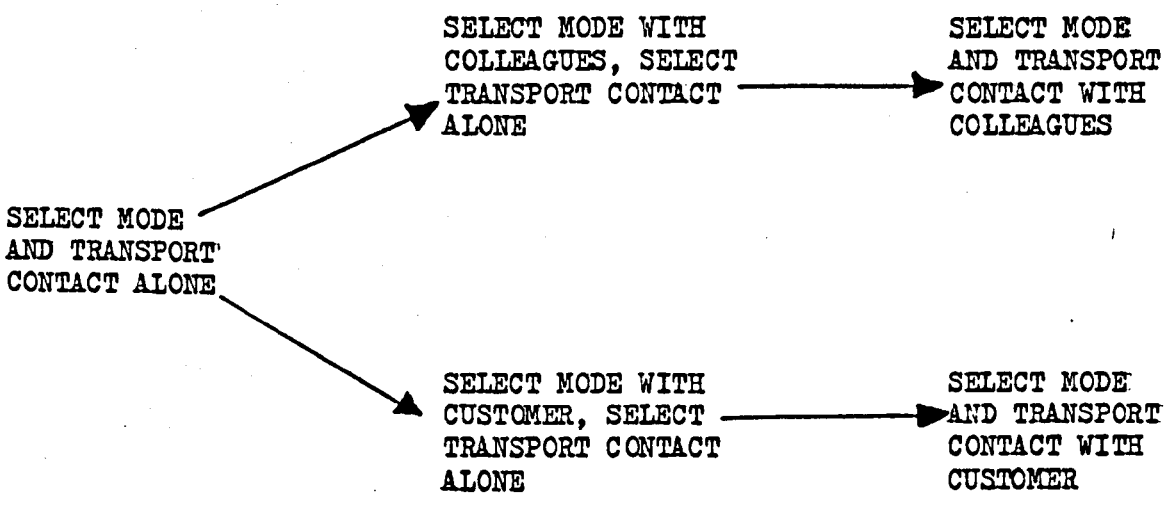


Figure 11.1 Lines of Diminishing Autonomy of Respondents

transport. The relationship between control of the international transport and the terms of sale is reflected in the greater likelihood of respondents knowing the international freight rate for goods sold on c.i.f. or delivered domicile terms (table 11.2).

When considering the relationship between trading channel variables and modal choice, the terms of sale and the type of customer do not appear to be related to the choice of mode when each of the channel variables is considered in isolation (table 11.1 and table 11.3) However, when the terms of sale (territorial contrast) are considered in conjunction with the type of customer it would appear that the greater propensity for manufacturers and divisions of the respondents' own companies to purchase on c.i.f. or delivered domicile terms is more closely related to surface transport (table 11.5b). Consignments are less likely to be regular, repeat orders if they are sent by air (table 11.4), although air transport is much more likely to be used for a higher proportion of regular, repeat orders when the terms of sale are ex works or f.o.b. This result may suggest that continental buyers are more inclined to use air when they control the terms of sale than are UK exporters, although it does not appear to depend on the type of customer (table 11.7).

There are a number of significant differences between the modes when examining the relationship between the tranport channel and modal use. A much higher proportion of route-services employ a freight forwarder for air transport (indeed, practically all air users), whereas about half of the route-services have respondents dealing directly with carriers for their surface transport (table 11.8). There is a tendency to use more transport contacts on a route-service for surface transport (table 11.10), whereas, in contrast, there is a tendency to use the same transport contact for more than one route-service for air as opposed to surface transport (table 11.11). Also, respondents tend to keep the same operator for a longer period for air transport than for surface transport (table 11.12). Thus, the general picture which emerges is that the shipping manager's approach towards surface transport is much more differentiated than towards air transport.

The chapter identified two main paths of diminishing decision making autonomy for the respondents - towards colleagues and towards customers (table 11.13 and figure 11.1). The level of autonomy is related to variables in the trading channel rather than in the transport channel (table 11.15) and appears to have no significant impact on modal use by the respondent's firm (table 11.14).

The two preceding chapters looked at the physical measurements of the transport system and their potential impact on modal choice, whereas the current chapter has adopted an approach aimed at organisational factors, looking at the relationship between channel members and the responsibility of the respondent as a decision maker. The following chapter concentrates on the respondent as an individual by examining his individual perceptions of the transport system in terms of cognitive structures.

APPENDIX TO CHAPTER 11

Terms of Sale

Mode	Ex Works	F.O.B.	C.I.F.	Delivered Domicile
Air	8(47.1%)	18(42.9%)	15(50%)	5(23.8%)
Surface	9(52.9%)	24(57.1%)	15(50%)	16(76.2%)
Total (100%)	17	42	30	21
Column as %	15.5%	38.2%	27.3%	19.1%

Chi square = 3.84 with 3 d.f. significance = 0.28
Numbers refer to route-services.

11.1(a) Separate terms of sale

Terms of Sale

	Territorial contrast		Through-transport Contrast	
Mode	Ex Works + F.O.B.	C.I.F. + Delivered Domicile	Ex Works + Delivered Domicile	F.O.B. + C.I.F.
Air	26(44.1%)	20(39.2%)	13(34.2%)	33(45.8%)
Surface	33(55.9%)	31(60.8%)	25(65.8%)	39(54.2%)
Total (100%)	59	51	38	72
Column as %	53.6%	46.4%	34.5%	65.5%
Chi square = 0.10 with 1 d.f. Sig = 0.75			Chi sq = 0.94 with 1 d.f. Sig =0.33	

Numbers refer to route services

11.1(b) Territorial and through-transport contrasts for terms of sale

Table 11.1 Terms of Sale by Mode

Able to quote freight rate? *	Terms of Sale: Territorial contrast — Ex Works + F.O.B.	Territorial contrast — C.I.F. + Delivered Domicile	Through-transport contrast — Ex Works + Delivered Domicile	Through-transport contrast — F.O.B. + C.I.F.
COMBINED MODES				
Yes	17(28.8%)	28(70%)	14(43.8%)	31(46.3%)
No	42(71.2%)	12(30%)	18(56.3%)	36(53.7%)
Total (100%)	59	40	32	67
Column as %	59.6%	40.4%	32.3%	67.7%
	Chi sq = 14.69, 1d.f. Sig = 0.0001		Chi sq = 0.00,1 d.f. Sig =0.98	
AIR ONLY				
Yes	9(34.6%)	10(71.4%)	7(63.6%)	12(41.4%)
No	17(65.4%)	4(28.6%)	4(36.4%)	17(58.6%)
Total (100%)	26	14	11	29
Column as %	65.0%	35.0%	27.5%	72.5%
	Chi sq = 3.58,1 d.f. Sig=0.06		Chi sq = 0.82,1 d.f. Sig=0.37	
SURFACE ONLY				
Yes	8(24.2%)	18(69.2%)	7(33.3%)	19(50.0%)
No	25(75.8%)	8(30.8%)	14(66.7%)	19(50.0%)
Total (100%)	33	26	21	38
Column as %	55.9%	44.1%	35.6%	64.4%
	Chi sq = 10.19,1 d.f. Sig=0.001		Chi sq = 0.92,1 d.f. Sig=0.34	

* 'Yes' refers only to route-services where the actual freight rate was quoted. 'No' refers only to route-services where the respondent stated specifically that he did not know the freight rate (see text).

Table 11.2 Relationship between Knowledge of Freight Rate and Terms of Sale

Type of Customer:

Mode	Retailer	Wholesaler	Manufacturer	Division of own Company	Other *
Air	6(42.9%)	35(50.0%)	13(48.1%)	13(48.1%)	6(37.5%)
Surface	8(57.1%)	35(50.0%)	14(51.9%)	14(51.9%)	10(62.5%)
Total	14	70	27	27	16
Column as %	9.1%	45.5%	17.5%	17.5%	10.4%

Chi sq = 1.28, 4 d.f. Sig = 0.94

* Includes cases where more than one type entered

Numbers refer to route-services

11.3(a) All classes of customer type

Type of Customer:

Mode	Retailer and Wholesaler	Manufacturer and Division of own Company
Air	41(48.8%)	26(48.1%)
Surface	43(51.2%	28(51.9%)
Total	84	54
Column as %	60.9%	39.1%

Chi sq = 0.01, 1d.f. Sign = 0.92

Numbers refer to route-services

11.3(b) Consolidated customer types

Table 11.3 Customer Types by Mode

Mode	Percentage of Regular, Repeat Orders			
	less than 25%	26 - 50%	51 - 75%	76 - 100%
Air	33(66%)	9(40.9%)	16(47.1%)	12(26.7%)
Surface	17(34%)	13(59.1%)	18(52.9%)	33(73.3%)
Total (100%)	50	22	34	45
Colum as %	33.1%	14.6%	22.5%	29.8%

Chi square = 15.04 with 3 d.f. Significance = 0.002
Numbers refer to route-services

Table 11.4 Regularity of Orders by Mode

Type of Customer	Terms of Sale: Territorial Contrast — Ex Works + F.O.B.	Territorial Contrast — C.I.F. + Delivered Domicile	Through-transport Contrast — Ex Works + Delivered Domicile	Through-transport Contrast — F.O.B. + C.I.F.
Retailer and Wholesaler	41 (70.7%)	14 (38.9%)	16 (50%)	39 (62.9%)
Manufacturer and Division of own company	17 (29.3%)	22 (61.1%)	16 (50%)	23 (37.1%)
Total (100%)	58	36	32	62
Column as %	61.7%	38.3%	34.0%	66.0%
Chi sq = 7.99, 1 d.f. Sig=0.005			Chi sq = 0.96, 1 d.f. Sig=0.33	

Numbers refer to route-services

11.5(a) Combined modes by territorial and through-transport contrasts

Type of Customer	Terms of sale (Territorial contrast): Air only — Ex works + F.O.B.	Air only — C.I.F. + Delivered Domicile	Surface only — Ex works + F.O.B.	Surface only — C.I.F. + Delivered Domicile
Retailer and Wholesaler	17 (65.4%)	6 (42.9%)	24 (75.0%)	8 (36.4%)
Manufacturer and Division of own company	9 (34.6%)	8 (57.1%)	8 (25.0%)	14 (63.6%)
Total (100%)	26	14	32	22
Column as %	65%	35%	59.3%	40.7%
Chi sq = 1.08, 1 d.f. Sig=0.30			Chi sq = 6.54, 1 d.f. Sig=0.01	

Numbers refer to route-services

11.5(b) Separate modes by territorial contrast

Table 11.5 Relationship between Type of Customer and Terms of Sale

Regularity of Orders	Terms of Sale: Territorial contrast — Ex works + F.O.B.	Territorial contrast — C.I.F. + Delivered Domicile	Through-transport contrast — Ex works + Delivered Domicile	Through-transport contrast — F.O.B. + C.I.F.
AIR ONLY				
Up to 50%	12(46.2%)	16(80%)	10(76.9%)	18(54.5%)
51-100%	14(53.8%)	4(20%)	3(23.1%)	15(45.5%)
Total (100%)	26	20	13	33
Column as %	56.5%	43.5%	28.3%	71.7%
Chi sq = 4.11,1 d.f. Sig=0.04			Chi sq = 1.13,1d.f. Sig=0.29	
SURFACE ONLY				
Up to 50%	12(36.4%)	11(35.5%)	7(28%)	16(41%)
51-100%	21(63.6%)	20(64.5%)	18(72%)	23(59%)
Total (100%)	33	31	25	39
Column as %	51.6%	48.4%	39.1%	60.9%
Chi sq = 0.04,1d.f. Sig=0.85			Chi sq = 0.63,1d.f. Sig=0.43	

Numbers refer to route-services

Table 11.6 Relationship between Regular, Repeat Orders and Terms of Sale by Mode

Regularity of orders	Customer Type: Air only — Retailer and Wholesaler	Air only — Manufacturer and Division of own company	Surface only — Retailer and Wholesaler	Surface only — Manufacturer and Division of own company
Up to 50%	26(63.4%)	10(43.5%)	16(37.2%)	8(28.6%)
51-100%	15(36.6%)	13(56.5%)	27(62.8%)	20(71.4%)
Total (100%)	41	23	43	28
Column as %	64.1%	35.9%	60.6%	39.4%
Chi sq = 1.64, 1d.f. Sig =0.20			Chi sq = 0.25, 1d.f. Sig=0.62	

Numbers refer to route-services

Table 11.7 Relationship between Regular, Repeat Orders and Customer Type by Mode

Mode	Transport Contact Type: Freight Forwarder	Other
Air	46(63.9%)	4(12.5%)
Surface	26(36.1%)	28(87.5%)
Total (100%)	72	32
Columns as %	69.2%	30.8%

Chi sq = 21.42 1d.f. Sig= <0.0001

Numbers refer to route services

Table 11.8 Relationship between Operator Type and Mode

	Transport Contact Size	
Mode	Large	Small
Air	27(50%)	12(42.9%)
Surface	27(50%)	16(57.1%)
Total (100%)	54	28
Columns as %	65.9%	34.1%

Chi sq = 0.15 1d.f. Sig=0.70
Numbers refer to route services

Table 11.9 Relationship between Operator Size and Mode

	No. of transport contacts		
Mode	1	2	3 or more
Air	54(56.8%)	16(41%)	3(15%)
Surface	41(43.2%)	23(59%)	17(85%)
Total (100%)	95	39	20
Columns as %	61.7%	25.3%	13.0%

Chi sq = 12.45 2d.f. Sig = 0.002
Numbers refer to route-services

Table 11.10 Relationship between No. of operators and Mode

I Respondents who provided information about two air and two surface route-services (Total = 27 respondents)

	No. of respondents
Use the same main transport contact for all four route-services	1
Use a different main transport contact for each of the four route-services	4
Use a single main transport contact for both air route-services and a separate single main transport contact for both surface route-services	6
Use a single main transport contact for both air route-services and a different main transport contact for each surface route-service	16
Use a different main transport contact for each air route-service and a single main transport contact for both surface route-services	0

II Respondents who provided information only about air route-services (Total = 6 respondents, of which 5 respondents each 4 route-services and 1 respondent 3 route-services)

	No. of respondents
Use the same main transport contact for all route-services	5
Use a different main transport contact for each route-service.	1

III Respondents who provided information only about surface route-services (Total 8 respondents, of which 4 respondents each 4 route-services, 1 respondent 3 route-services,and 3 respondents each 2 route-services.

	No. of respondents
Use the same main transport contact for all route-services	1
Use a different main transport contact for each route-service	7

4 respondents not included - either no reply, other combinations or more than one main transport contact on a route-service.

Table 11.11 Combinations of Transport Contacts according to Mode

Mode	Time used main transport contact 0-1 yr	1-2 yr	3-4 yr	5-9 yr	10+ yr
Air	3(14.3%)	17(43.6%)	21(47.7%)	12(60%)	20(66.7%)
Surface	18(85.7%)	22(56.4%)	23(52.3%)	8(40%)	10(33.3%)
Total (100%)	21	39	44	20	30
Column as %	13.6%	25.3%	28.6%	13.0%	19.5%

Chi sq = 15.21 4d.f. Significance 0.004

Numbers refer to route-services

Table 11.12 Relationship between Time used Main Transport Contact and Mode

Decision-making Involvement in Selection of Transport Contact

Decision-Making Involvement in Selection of Mode	Mode	Respondent decides alone	Joint decision with colleagues	Joint decision with customer	Respondent not involved
Respondent decides alone	Both	25(16.6%)	0	0	0
	Air	9(12.9%)	0	0	0
	Surface	16(19.8%)	0	0	0
Joint decision with colleagues	Both	22(14.6%)	26(17.2%)	4(2.6%)	0
	Air	14(20.0%)	10(14.3%)	1(1.4%)	0
	Surface	8(9.9%)	16(19.8%)	3(3.7%)	0
Joint decision with customer	Both	31(20.5%)	7(4.6%)	27(17.9%)	0
	Air	16(22.9%)	6(8.6%)	10(14.3%)	0
	Surface	15(18.5%)	1(1.2%)	17(21.0%)	0
Respondent not involved	Both	0	4(2.6%)	4(2.6%)	1(0.7%)
	Air	0	2(2.9%)	2(2.9%)	0
	Surface	0	2(2.5%)	2(2.5%)	1(1.2%)

Numbers refer to route-services

Percentages refer to % of all route-services for the mode used in the analysis

Table 11.13 Decision-making Relationship between Selection of Mode and Selection of Transport Contact

MODE	RESPONDENT SELECTS MODE AND TRANSPORT CONTACT ALONE	RESPONDENT SELECTS MODE WITH COLLEAGUES, SELECTS TRANSPORT CONTACT ALONE	RESPONDENT SELECTS MODE AND TRANSPORT CONTACT WITH COLLEAGUES
Air	9(36%)	14(63.6%)	10(38.5%)
Surface	16(64%)	8(36.4%)	16(61.5%)
Total (100%)	25	22	26
Column as %	34.2%	30.1%	35.6%

Chi sq = 3.95 with 2 d.f. Significance ≙ 0.25

Numbers refer to route-services

11.14(a) Decision-making relationship with colleagues

MODE	RESPONDENT SELECTS MODE AND TRANSPORT CONTACT ALONE	RESPONDENT SELECTS MODE WITH CUSTOMER, SELECTS TRANSPORT CONTACT ALONE	RESPONDENT SELECTS MODE AND TRANSPORT CONTACT WITH CUSTOMER
Air	9(36%)	16(51.6%)	10(37%)
Surface	16(64%)	15(48.4%)	17(63%)
Total (100%)	25	31	27
Column as %	30.1%	37.3%	32.5%

Chi sq = 1.78 with 2 d.f. Significance ≙ 0.50

Numbers refer to route-services

11.14(b) Decision-making relationship with customers

Table 11.14 Relationship between Decision-making and Modes

Trading Channel	*Decision-making relationship with colleagues: Both Modes	Air	Surface	*Decision-making relationship with customer: Both Modes	Air	Surface
Terms of Sale Territorial contrast (Table 11.1b)	Chi sq = 4.94 2 d.f. (0.08)	5.16 2 d.f. (0.08)	1.04 2 d.f. (0.60)	27.99 2 d.f. (0.0001)	12.22 2 d.f. (0.002)	16.52 2 d.f. (0.0003)
Gave freight rate (Table 11.2)	Chi sq =19.04 2 d.f. (0.0001)	13.08 2 d.f. (0.001)	7.88 2 d.f. (0.02)	5.80 2 d.f. (0.06)	3.55 2 d.f. (0.17)	12.97 2 d.f. (0.002)
Customer type (Table 11.3b)	Chi sq = 5.58 2 d.f. (0.06)	7.04 2 d.f. (0.03)	0.64 2 d.f. (0.73)	27.98 2 d.f. (0.0001)	11.59 2 d.f. (0.003)	17.09 2 d.f. (0.0002)
Regular, repeat orders (Table 11.4)	Chi sq = 8.06 2 d.f. (0.02)	4.52 2 d.f. (0.10)	2.50 2 d.f. (0.29)	0.88 2 d.f. (0.65)	3.30 2 d.f. (0.19)	1.04 2 d.f. (0.60)
Transport Channel						
Type of transport contact (Table 11.8)	Chi sq = 1.46 2 d.f. (0.48)	2.16 2 d.f. (0.34)	1.36 2 d.f. (0.93)	0.10 2 d.f. (0.95)	N/A	0.01 2 d.f. (0.99)
Transport contact size (Table 11.9)	Chi sq = 3.04 2 d.f. (0.22)	2.24 2 d.f. (0.33)	2.24 2 d.f. (0.33)	0.12 2 d.f. (0.94)	1.29 2 d.f. (0.52)	0.61 2 d.f. (0.74)
No. of transport contacts (Table 11.10)	Chi sq = 2.24 4 d.f. (0.69)	1.37 2 d.f. (0.50)	1.42 2 d.f. (0.84)	3.74 4 d.f. (0.44)	2.93 4 d.f. (0.57)	5.55 4 d.f. (0.24)
Time used Transport contact (Table 11.12)	Chi sq = 7.12 8 d.f. (0.52)	9.89 8 d.f. (0.27)	11.92 8 d.f. (0.15)	14.60 8 d.f. (0.07)	11.51 6 d.f. (0.07)	12.15 8 d.f. (0.14)

* Table shows relationships between the two sets of three degrees of decision-making given in table 11.14 and trading and transport channel variables. Categories of channel variables are as given in associated tables. Chi square level of significance is given in parentheses. Variables including significant differences at the 0.05 level are boxed.

Table 11.15 Relationship between Decision-making and Channel Variables

	Mode	Respondent selects mode and transport contact alone	Respondent selects mode with customer, selects transport contact alone	Respondent selects mode and transport contact with customer
Terms of Sale				
Ex works and f.o.b.	Both	5(25.0%)	4(25.0%)	19(100%)
	Air	1(14.3%)	2(33.3%)	8(100%)
	Surface	4(30.8%)	2(20.0%)	11(100%)
c.i.f. and delivered domicile	Both	15(75.0%)	12(75.0%)	0(0%)
	Air	6(85.7%)	4(66.7%)	0(0%)
	Surface	9(69.2%)	8(80.0%)	0(0%)
Knowledge of Freight Rate				
Gave freight rate	Both	12(57.1%)	15(60.0%)	8(29.6%)
	Air	6(85.7%)	5(41.7%)	6(60.0%)
	Surface	6(42.9%)	10(76.9%)	2(11.8%)
Not known entered	Both	9(42.9%)	10(40.0%)	19(70.4%)
	Air	1(14.3%)	7(58.3%)	4(40.0%)
	Surface	8(57.1%)	3(23.1%)	15(88.2%)
Customer Type				
Retailer and Wholesaler	Both	5(23.8%)	22(78.6%)	25(92.6%)
	Air	1(14.3%)	12(75.0%)	9(90.0%)
	Surface	4(28.6%)	10(83.3%)	16(94.1%)
Manufacturer and Division of own company	Both	16(66.7%)	6(21.4%)	2(7.4%)
	Air	6(85.7%)	4(25.0%)	1(10.0%)
	Surface	10(71.4%)	2(16.7%)	1(5.9%)

Numbers refer to route services

Table 11.16 Significant Relationships with the Line of Diminishing Autonomy (Customers)

	Mode	Respondent selects mode and transport contact alone	Respondent selects mode with colleagues, selects transport contact alone	Respondent selects mode and transport contact with colleagues
Knowledge of Freight Rates				
Gave freight rate	Both	12(57.1%)	17(85.0%)	4(18.2%)
	Air	6(85.7%)	11(84.6%)	1(12.5%)
	Surface	6(42.9%)	6(85.7%)	3(21.4%)
Not known entered	Both	9(42.9%)	3(15.0%)	18(81.8%)
	Air	1(14.3%)	2(15.4%)	7(87.5%)
	Surface	8(57.1%)	1(14.3%)	11(78.6%)
Customer Type				
Retailer and Wholesaler	Both	5(23.8%)	11(61.1%)	9(40.9%)
	Air	1(14.3%)	9(75.0%)	3(37.5%)
	Surface	4(28.6%)	2(33.3%)	6(42.9%)
Manufacturer and Division of own company	Both	16(76.2%)	7(38.9%)	13(59.1%)
	Air	6(85.7%)	3(25.0%)	5(62.5%)
	Surface	10(71.4%)	4(66.7%)	8(57.1%)
Regularity of Orders				
Up to 50% regular, repeat orders	Both	11(44.0%)	14(63.6%)	6(23.1%)
	Air	6(66.7%)	10(71.4%)	3(30.0%)
	Surface	5(31.3%)	4(50.0%)	3(18.8%)
More than 50% regular, repeat orders	Both	14(56.0%)	8(36.4%)	20(76.9%)
	Air	3(33.3%)	4(28.6%)	7(70.0%)
	Surface	11(68.8%)	4(50.0%)	13(81.3%)

Numbers refer to route-services

Table 11.17 Significant Relationships with the Line of Diminishing Authority (Colleagues)

CHAPTER 12 ANALYSIS OF COGNITIVE STRUCTURES.

12.1 Introduction

The social perceptual approach to freight modal choice described in chapter five assumes that implicit theories are developed by socio-organisational groups. The current chapter analyses the nature of 'cognitive structures' based on the repertory grids of individual respondents. An understanding of cognitive structures is required for the analysis of implicit theories in the following chapter. Cognitive structures describe the patterns of relationships between route-services and the constructs which the respondents use to describe them.

The complexity of shipper organisations has already been described in chapter six, and it is clear that the total decision making pattern varies from company to company. However, the conceptual model proposed that it is reasonable to assume that a commonality of experience exists between members of different organisations undertaking similar functions and that similar experiences are likely to result in an 'agreed' implicit theory. The social perceptual approach assumes that any freight modal choice decision may be influenced by a number of different socio-organisational groups with different theories.

The objective of this chapter is to analyse the cognitive structures of a particular group (shipping managers). The analysis is based on a sample of 17 respondents taken from the wider survey sample used in the preceding chapters of analysis. An assessment of the representativeness of the sample is found in chapter eight.

The concept of cognitive structures has been made operational by means of the repertory grid. The analysis in this chapter is at the level of the individual person and his mental representation of a transport system based on his experience.

There are three main areas of analysis in this chapter. They are

a) Analysis of elicited constructs

b) Analysis of principal components

c) Analysis of relationships between route- services

In common with the preceding chapters of analysis only the immediate results are reported in this chapter. Discussion of the wider implications is reserved until the following chapter. Tables of analysis directly relevant to the chapter are included as a separate chapter appendix. In addition, reference is made to more detailed data which is included in the main appendix.

12.2 Analysis of elicited constructs.

The elicitation procedure has been described in detail in chapter seven and the current section restricts itself to the results obtained from the elicitation. Each individual respondent's repertory grid consists of eight route-services of which four are air and four are surface transport. Chapter seven described how the elicitation of constructs was achieved by comparing either a 'most preferred' route-service for a given mode with a

'least preferred' route-service for the same mode (ie air compared with air or surface compared with surface transport), or by comparing the mode used with the alternative mode for the same route (route is equivalent to destination country in this analysis). The former class of comparisons may be called intramodal contrasts and the latter intermodal contrasts. Intramodal contrasts always involve only route-services used by the respondent whereas for intermodal contrasts it is possible that only one of the alternatives is used. However, the route-services entered in the repertory grids are all used by the appropriate respondents. 167 constructs were elicited from the 17 respondents. A complete list of constructs is given in appendix D together with the type of modal contrast used in the elicitation.

The constructs are classified according to subject headings (eg depot delays). This classification was made post hoc by the researcher on the basis of the content of the constructs. An examination of the constructs will show that there are similarities in the wording of many of them, since the exact wording of the constructs was made by the researcher. After a number of interviews, patterns began to emerge and it was convenient to use the same form of construct where the elicitations of different respondents appeared to be similar. Most elicited constructs appeared unambiguous; the only 'prompt' frequently used by the researcher was to identify the meaning of 'transit time' - whether it referred to the total door-to-door time or merely to the international transit of the mode (eg only to the air journey).

It could be claimed that the constructs cease to be personal to the respondents when this degree of standardisation takes place. However, the approach was not intended to be entirely personal but to provide a formal approach which is more personal than most survey studies. This matter has been discussed fully in chapter seven.

Table 12.1 is a summary of appendix D. The results suggest that considerations about transport contact organisations are important in intramodal surface contrasts whereas customs clearance is particularly associated with intramodal air contrasts. If intermodal contrasts are compared with intramodal contrasts in toto it would appear that the former are more likely to take into account considerations of urgency and, to a lesser extent, the product. Intramodal contrasts are more likely to take into account the frequency of departure, monitoring and control, documentation, and depot delays. There is a tendency for intramodal contrasts to be more concerned with qualities of the transport services whereas intermodal contrasts appear more directly concerned with aspects of the shipper company.

Table 12.2 shows the number of constructs elicited from each respondent (called A, B etc to preserve confidentiality), the number of constructs used in each repertory grid, the number of different categories of construct elicited, and the number of constructs ultimately used in the principal components analysis of each repertory grid. Where a construct was elicited more than once from a respondent (in other words he provided the same reason for more than one modal contrast) it was subsequently used only once in the repertory grid. It can be seen that most respondents mentioned between one-third and two-thirds of the eighteen categories of construct provided by the group of respondents as a whole. Consideration of the principal components analysis will be reserved until section 12.3

Table 12.3 shows the number of respondents who mentioned each category of construct. The most frequently mentioned categories were 'emergency' (14 respondents), 'transport contacts' (11 respondents) and depot delays (12 respondents).

12.3 Analysis of principal components.

Each respondent was presented with a repertory grid based on his elicited eight route-services and his personal constructs. Since the number of constructs in the grids ranged from 6 to 13 (see table 12.2) it meant that respondents were required to make from 48 judgements (in an 8by 6 grid) to 104 judgements (in any 8 by 13 grid). The resulting judgements based on a 5-point scale for each construct are given in appendix E. The exact form of a repertory grid as presented to a respondent is shown in chapter seven figure 7.2.

It is assumed that each repertory grid contains an underlying pattern which will provide an insight into each respondent's cognitive structure of the transport system represented in his eight route-services. A technique is required to simplify or reduce the data of the grids in order to identify major independent dimensions which account for most of the variance in the original raw data. It was decided to use a data-reduction technique, widely used in the analysis of repertory grids, known as principal components analysis. Principal components analysis is particularly suited to the analysis of repertory grids and personal constructs since it is based on the projection of principal axes through clusters of vectors representing the variables or, as they are called in this study, constructs. Thus, the principal axes or components may be seen as superordinate constructs with their own bipolarity (see chapter four for discussion of superordinate constructs and the bipolarity of constructs).

Principal components analysis extracts the best linear combination of variables which accounts for more of the variance in the data than any other single linear combination. The second component is the linear combination which accounts for most of the residual variance after extraction of the first component, and so on. The raw data is transformed into a correlation matrix and the principal components analysis is performed on the product- moment correlation coefficients. Principal components analysis accounts for all the variance in a data matrix and as many components will be extracted as there are input variables (constructs). In the current analysis, in keeping with many principle components analyses, only those components with an eigenvalue (see appendix F) of 1.00 or greater are considered. In such cases it means that the component explains more variance than a single construct (1.00 equals the variance of each standardised variable). The great majority of the variance in the raw data matrix is usually accounted for by relatively few components, thus achieving parsimony in the description of the data. A full description of principal components analysis is provided in appendix F.

Principal components analysis is concerned with variance among constructs so that it cannot take account of constructs in the repertory grids where a respondent makes the same judgement (ie the same score on a five-point scale) for all eight route-services. This applied to 18 (11%) of the 161 constructs included in the repertory grid of the entire group of respondents. A full list of the constructs excluded from the principal components analysis is given in appendix G. There is no obvious pattern in the

group of excluded constructs except that 'consignee's influence' is prominent (of the eight respondents who mentioned it, three were unable to make differential judgements). Eight respondents had one or two constructs where they were unable to make differential judgements, one respondent had three and one respondenthad four such constructs.

The eigenvalues of the largest components for each respondent are shown in table 12.4. All respondents have from one to three significant components, where a significant component is defined as one with an eigenvalue of 1.00 or more. Two respondents have one significant component, ten respondents have two, and five respondents have three. Table 12.4 shows that the five respondents with three significant components have, with one exception, a greater than average number of constructs. Thus, their capacity to produce more constructs is reflected in a more 'complex' cognitive structure. The percentage of 'explained' variance for the significant components of each respondent ranges from 74.1% to 98.6%. Slater (1977) describes how the first few components usually account for such high proportions of explained variance in the grids of <u>individuals</u>, whatever the topic area, in contrast to grids which are the combined scores of a number of individuals or grids which have been derived from random numbers. In the latter two cases the first three components usually account for a much lower proportion of explained variance. According to Slater individuals often appear to explain aspects of their worlds along a limited number of dimensions.

An oblique rotation of the principal axes was undertaken in order to obtain a simpler interpretation of the underlying dimensions of meaning in the repertory grids. Such a rotation places the axes as closely as possible to clusters of constructs resulting from the principal components analysis. However, at the same time, the orthogonality of the original unrotated axes may be lost if the components after oblique rotation are highly correlated. Table 12.5 shows the correlations of components with each other after oblique rotation and it is evident that in most cases the correlation between components is low. The number of correlations depends on the number of significant componentsextracted from a respondent's grid.

Appendix H shows the loading of each construct to each component for each respondent. For unrotated or orthogonally rotated components the square of the loadings in each column would be interpreted as correlations between each construct and each component, indicating the extent to which the component accounts for the variance of construct. However, owing to the existence of correlation between components after oblique rotation, the loadings shown in appendix H represent only the <u>direct</u> contribution of the component to the variance of a construct and do not take account of the <u>indirect</u> contribution through other correlated components. This would appear to offer no problems of interpretation since table 12.5 shows that the correlation between components is usually low.

Appendix H also gives a complete list of the constructs used in the principal components analysis and shows both the potential and actual range of polarity of the constructs. For example, the potential range of the first construct of respondent A shown in appendix H is 'handling at the destination airport or depot is'very good, quite good, neutral, quite bad, very bad'. The list of evaluations 'very good, quite good etc' represents the 5-point scale against which the respondent makes his judgements. A detailed discussion of scales has been made in chapter seven. Although the

potential poles of the construct are 'very good/very bad', in fact the respondent used a much narrower range and his actual construct was 'handling at the destination airport or depot is quite good, neutral'. Obviously 'bad' handling is not part of the frame of reference for respondent A when considering destination handling for his eight route-services. This detailed level of analysis of the individual respondents is not pursued here. Such an analysis would be useful in a case study approach where the cognitive structures of different members of staff in one company involved in freight transport decisions are compared.

Factor scores for each route-service were derived from the loadings for each significant component. The term 'factor scores' is used rather than 'component scores' to comply with common technology. The relationship between principal components analysis and factor analysis is discussed in appendix F. A complete list of factor scores for each component is given in appendix I. The scores have been standardised, meaning that they have been scaled to have a mean of zero and a standard deviation of 1.00. Using the factor scores and the loadings it is possible to classify components in three categories according to the criteria described below. The three categories of component are:

a) Evaluative components

b) Intermodal components

c) Preference components

Evaluative components are defined by the 'direction' of the poles of the dominant evaluative constructs in the component (ie the constructs with the highest loadings). An evaluative component is one for which all the dominant evaluative constructs have their 'good' pole associated with one pole of the component axis. It was mentioned in chapter four that the theory of personal constructs is based on the assumption that people construe the world in terms of bipolar constructs. For example, a transport service is assessed along a dimension ranging from very fast to very slow. Some constructs are obviously evaluative; for example, the first construct of respondent A in appendix H described earlier in this section, whereas other constructs are apparently not evaluative. For example, the fifth construct of respondent A in appendix H is 'capital equipment involving your engineers being on site is sent by this service always, often, neutral, seldom, never'. Although the ultimate meaning behind this construct may be evaluative, it would be unjustifiable to label it as evaluative as it stands. By taking only the <u>obviously</u> evaluative constructs and examining their polarity it was found that 26 of the total of 37 components were evaluative components.

Whether or not a component is evaluative depends mainly on the post-hoc assumptions of the researcher - which is, by the way, a method of classification used frequently in factor analysis. However, this is a somewhat unsatisfactory approach and the classification of evaluative components is used mainly in this work to support the results based on the intermodal components and the preference components which, as shown below, are derived objectively from statements made by respondents prior to elicitation of the constructs.

The other two classes of component are based on the sequence of factor scores (see appendix I). Since each respondent's set of factor scores has a mean of zero (because the sets have been standardised) there is a range of scores from a negative value to a positive value. After placing the factor scores in sequence of value, the sequence of route-services was examined. Intermodal components and preference components

were identified according to the rank order of different classes of route-services in the sequence of factor scores.

Intermodal components have a complete separation of air and surface route-services in the sequence of factor scores, meaning that the sequence must consist of four air route-services followed by four surface route-services (or the reverse). Thus, if air route- services are A and surface route- services S, the sequence from lowest to highest factor score must be either AAAASSSS or SSSSAAAA. Such components are assumed to describe how respondents differentiate between the air and surface modes in their cognitive structures.

The other category of component based on the sequence of route-services defined by factor scores is the preference component. Respondents were asked in the first questionnaire received by them to state their most and least preferred route-services for each of the two modes air and surface. Preference components are those where (after sequencing the factor scores by value) neither of the two most preferred route-services fall between the two least preferred route-services (or vice-versa) in theentire sequence of eight route-services. Thus, if most preferred route-services are M, least preferred route-services are L, and route-services which belong to neither category are N (neutral), then an acceptable sequence from lowest to highest factor score would be MNNMLNLN, whereas the sequence MNNNLLMN would not be acceptable as a preference construct since the two most preferred route-services are separated by least preferred route-services. There are, of course, many acceptable preference component sequences since the location of the 'neutral' route-services in the sequence is not taken into account. It was considered too restrictive to do so when the main consideration was essentially the contrast between most preferred and least preferred route-services. Preference components are assumed to describe how respondents assess transport services, irrespective of mode, in their cognitive structures.

Table 12.6 shows that 11 (65%) respondents' grids produce intermodal components and 13 (76%) grids produce preference components. One grid produces two intermodal components and three grids produce two preference components. All such components are considered in the subsequent analysis since they may all be considered as contributions to the 'agreed theory'. 8 (47%) of respondents' grids have both types of component.

Intermodal components and preference components are, by definition, exclusive since the sequence of route-services AAAASSSS (where A = air and S = surface) requires the interposing of one preference category between the two route-services of the other preference category, given that there is a most preferred and least preferred route-service for each mode (see table 12.6).
Table 12.7 shows that 14 of the 16 preference components are also evaluative components. This is to be expected if we assume that preference implies evaluation, and the result supports the validity of the approach adopted. Furthermore, an examination of appendices H and I will show that the most preferred route-services are always associated with the 'good' pole of the preference components. In contrast, only 6 of the 12 intermodal components may be classified as evaluative components. The apparent tendency for shipping managers to compare modes in a non-evaluative manner will be considered in the following chapter.

Many attitudinal studies attempt to consider the relative importance of attitudes in the light of their influence on the subject of the study. For example, a measure of importance of a construct may be the number of times it is elicited. The importance of each principal component to a subject is often assumed to be based on the amount of explained variance attributed to a component. In this sense, 'importance' is equivalent to the relative size of the patterns of variation of characteristics or constructs. However, possibly owing to the sequence of questioning during the elicitation stage, fewer intermodal contrasts were obtained than intramodal contrasts (40 compared with 127). Since this is likely to influence the relative 'importance' of components the analysis is restricted to consideration of the existence of significant components rather than to their relative importance.

It is possible to identify the constructs for which respondents make the most significant contrasts between(a) air and surface modes and (b) most and least preferred route-services by examining the patterns of constructs in terms of their loadings on particular classes of components. Appendices J and K show the constructs with the highest loadings for each respondent for intermodal and preference components respectively. The results have been abstracted from appendix H and the poles of negative loadings have been reversed for easier understanding of the results. In order to obtain uniformity between components, only constructs with a loading of 0.80 or more were included, unless a construct with a loading lower than but close to 0.80 is clearly isolated from the remaining constructs and is clearly one of the dominant constructs in the component.

Table 12.8 is derived from appendices J and K and shows the number of instances that particular types of construct are leading constructs for intermodal and preference components. It is noticeable that respondents tend to associate intermodal components with constructs about transport contacts, urgency of delivery and cost. These three categories account for 59% of leading constructs for intermodal components.

The pattern of constructs for preference components is less clear, with a wider range of leading construct classes, possibly reflecting the greater number of preference components (16) compared with intermodal components (12). However, preference components appear to be much more general so that the total number of leading constructs for preference components is 51 compared with 27 for intermodal components. Of the leading constructs in preference components, depot delays and monitoring and control appear to be significant, together with various aspects of the progress of consignments (documentation, final delivery, distance versus time, other aspects of time, clearance). Security, damage and loss appear to be strongly associated with preference components. Contrary to the results of table 12.1, transport contacts appear to be less associated with preference than with intermodal contrasts, although the distinction in table 12.1 was restricted to surface route-services.

Cost is associated with both preference and intermodal components, whereas frequency of departure does not appear to be associated with either, despite the evident difference between frequencies of departures for the two modes shown in chapter ten (table 10.8).

12.4 Analysis of relationships between route-services

The previous section has examined relationships between constructs and

components. This section examines dominant patterns of relationships between route-services. Although each set of route-services is particular to each respondent, there are underlying structures which are common to all respondents. Each respondent's set of route-services consists of four air and four surface route-services. Furthermore, each route-service has been assigned a preference (most preferred, least preferred, or neutral) by the respondent prior to the elicitation of the constructs. It is possible to identify patterns of relationships between route-services using these labels. Thus, this section examines another aspect of respondents' cognitive structures: the way in which they differentiate between modes in terms of preferences and between preferences in terms of modes.

Section 12.3 described how preferences and intermodal components were derived from the factor scores of route-services. Since all the sets of factor scores have been standardised (ie mean is zero and standard deviation is 1.00) it is possible to identify underlying patterns of differentiation for the group of respondents as a whole by directly comparing the factor scores for different components of the same category according to the classes of route-service which are common to all respondents (eg four air contrasted with four surface route-services).

Table 12.9 gives the mean factor scores for each preference class of route-service for the preference components. Before undertaking this analysis all factor scores of preference components were adjusted so that the 'most preferred' pole was at the negative end of the set of scores. Thus, the mean factor score for all most preferred route-services in preference components is -0.74, and for all least preferred route-services is 0.96. An indication of the validity of the approach adopted in this work is given by the mean score of -0.15 for all neutral route-services. Although the criterion for determining a preference component does not require that neutral route-services should fall between the most preferred extremes of preference (see section 12.3), the statistically significant difference (applying the t-test) between each preference class throughout table 12.9 suggests that the preference components distinguish three distinct classes of route-service in terms of preference. The results suggest that neutral route-services are more closely associated with most preferred route-services than with least preferred, particularly in the case of surface transport.

However, table 12.10 suggests that there does not appear to be any significant difference in the distribution of factor scores between modes in preference components. This is evidence of an <u>amodal</u> preference dimension in the respondents' cognitive structures.

Table 12.11 analyses the factor scores for the intermodal components with the route-services considered as classes of preference. For the analysis of this type of component the sequence of factor scores was ordered so that the 'air' pole was the negative extreme for the range of scores, and the 'surface' pole was the positive extreme. It can be seen that for both modes combined the 'preference' sequence was maintained with the mean scores of most preferred, neutral and least preferred route-services being -0.15, -0.02 and 0.22 respectively, although there was no significant difference between these scores when the t-test was applied. However, when the scores are disaggregated to the individual modes a different pattern emerges. For air route-services there is no significant difference between the preference classes, but for surface route-services the least preferred route-services are clearly isolated from the other two pref-ernce classes. If a t-test is applied the difference is significant between least preferred surface and neutral surface route-services at the 0.05 level, and almost significant at the same level between most pre-

ferred and least preferred surface.

For both modes the mean of the most preferred route-services is closer to the 'air' pole and, conversely, the mean of the least preferred route-services for both modes is closer to the 'surface' pole.

The final analysis in this section examines whether or not there is any difference between equivalent preferences for the two modes (eg between most preferred air and most preferred surface route-services). Table 12.12 shows that the only statistically significant difference (using the t-test) is between the mean factor score for least preferred air route-services (0.71) and least preferred surface route-services (1.24), with the mean for surface transport being significantly closer to the 'least preferred' pole of the preference components.

12.5 General conclusions

In keeping with the preceding chapters of analysis, only the direct results are considered here. The wider implications will be reserved for the following chapter which consolidates the results of the separate analyses.

The relationships between elicited constructs and route-services have been examined in a number of ways. Respondents tend to make judgements about transport contact organisations when asked to compare surface route-services, in contrast to air route-services where considerations of customs clearance are more likely. Respondents tend to mention urgency when asked to compare air with surface transport. The general pattern that emerges from the elicitations is that intramodal contrasts tend to be more associated with attributes of the transport system, whereas intermodal contrasts tend to be more associated with aspects of the shipper or product.

The most frequently mentioned categories of construct were those concerned with urgency, transport contacts and depot delays, possibly identifying the prime problem areas of the respondents.

Two objectively derived components of combinations of constructs were obtained by means of principal components analysis. They were intermodal components (contrasting air and surface transport) and preference components (contrasting most preferred and least preferred route-services irrespective of mode). It was found that intermodal components tend to be dominated by constructs concerned with urgency, and with transport contacts. In contrast, preference components tend to be associated with depot delays, monitoring and control, final delivery, distance versus time (and other aspects of transit time), customs clearance, and security, damage and loss.

The relationships between the route-services were examined and, in terms of the factor scores obtained from the principal components analysis it appeared that the group of respondents make a greater differentiation between surface than between air route-services. Air is generally perceived as a 'better' mode of transport than surface insofar as a greater distinction is made between the least preferred air and surface route-services. However, there appears to be no difference between most preferred air and surface route-services in terms of general quality.

There are many other aspects of repertory grids which can be analysed. In particular, the grids of individual respondents could be analysed in greater depth - such an analysis might be particularly relevant if the cognitive structures of different role-holders in the same company were being assessed in a case study. However, it has been made clear that the purpose of this analysis is to attempt to find a path between case studies and general surveys. One possible influence on the results not discussed here is the influence of different countries which is not considered in this work.

APPENDIX TO CHAPTER 12

CONSTRUCT SUBJECT MATTER	MOST PREFERRED AIR V. LEAST PREFERRED AIR	MOST PREFERRED SURFACE V LEAST PREFERRED SURFACE	AIR V SURFACE FOR SAME ROUTE	TOTAL
Transport contacts	3(5.2%)	17(24.6%)	2(5%)	22
Cost versus time	3(5.2%)	-	3(7.5%)	6
Product	1(1.7%)	-	6(15.0%)	7
Shipper (other than product)	3(5.2%)	1(1.4%)	2(5.0%)	6
Urgency	3(5.2%)	-	13(32.5%)	16
Frequency of departure	5(8.6%)	5(7.2%)	-	10
Cost (other than related to time	4(6.9%)	6(8.7%)	3(7.5%)	13
Monitoring and control	7(12.1%)	5(7.2%)	-	12
Clearance	8(13.8%)	1(1.4%)	-	9
Security, damage, loss	1(1.7%)	3(4.3%)	-	4
Transport equipment	-	1(1.4%)	-	1
Distance versus time	2(3.4%)	3(4.3%)	3(7.5%)	8
Final delivery	3(5.2%)	5(7.2%)	1(2.5%)	9
Time (other than related to distance and cost)	2(3.4%)	4(5.8%)	-	6
Documentation	3(5.2%)	8(11.6%)	-	11
Consignee's influence	1(1.7%)	3(4.3%)	4(10.0%)	8
Flexibility	-	-	1(2.5%)	1
Depot delays	9(15.5%)	7(10.1%)	2(5.0%)	18
Total	58(100%)	69(100%)	40(100%)	167

Table 12.1 Contrasts used to elicit constructs.

RESPONDENT REF	NO. OF CONSTRUCTS ELICITED	NO. OF CONSTRUCTS USED IN REPERTORY GRID	NO. OF CONSTRUCTS USED IN PRINCIPAL COMPONENTS ANALYSIS	NO. OF DIFFERENT CLASSES OF CONSTRUCT ELICITED
A	8	7	5	5
B	11	9	9	9
C	7	7	7	6
D	15	13	13	7
E	11	11	11	9
F	10	10	10	9
G	12	12	11	10
H	11	11	10	10
I	12	12	12	7
J	7	7	7	6
K	10	10	7	7
L	11	11	7	10
M	10	10	9	8
N	6	6	4	6
O	8	8	6	8
P	6	6	5	6
Q	11	11	10	10
Total	166	161	143	

Table 12.2 Frequency of constructs at different stages of analysis

CONSTRUCT CATEGORY	NO. OF RESPONDENTS MENTIONING CATEGORY	NO. OF ELICITATIONS OF CATEGORY
Transport contacts	11	22
Cost versus time	5	6
Product	7	7
Shipper(other than product)	5	6
Emergency or urgency	14	16
Frequency of departure	8	10
Cost(other than related to time)	9	13
Monitoring and control	9	12
Clearance	9	9
Security,damage,loss	4	4
Transport equipment	1	1
Distance versus time	7	8
Final delivery	8	9
Time (other than related to distance or cost)	6	6
Documentation	9	11
Consignee's influence	8	8
Flexibility	1	1
Depot delays	12	17
Total		166

Table 12.3 No. of respondents mentioning construct categories

RESPONDENT	No. OF CONSTRUCTS(*)	EIGENVALUE FOR COMPONENT 1	COMPONENT 2	COMPONENT 3	CUMULATIVE % OF COMPONENTS WITH EIGENVALUE GREATER THAN 1.00
A	5	3.10(62.0%)	1.03(20.6%)	0.81(16.2%)	82.6
B	9	4.41(49.0%)	2.83(31.4%)	0.94(10.4%)	80.4
C	7	5.81(83.0%)	0.71(10.2%)	0.26(3.7%)	83.0
D	13	7.91(60.9%)	2.37(18.2%)	1.29(9.9%)	89.0
E	11	7.22(65.6%)	1.81(16.5%)	0.83(7.5%)	82.1
F	10	6.29(62.9%)	1.55(15.5%)	0.91(9.1%)	78.4
G	11	5.72(52.0%)	3.32(30.2%)	1.11(10.1%)	92.2
H	10	4.48(44.8%)	2.81(28.1%)	1.66(16.6%)	89.4
I	12	6.95(57.9%)	2.43(20.3%)	1.35(11.3%)	89.4
J	7	3.85(55.0%)	1.54(22.0%)	0.94(13.5%)	76.9
K	7	5.66(80.9%)	1.01(14.4%)	0.26(3.6%)	95.3
L	7	3.42(48.8%)	2.61(37.2%)	0.58(8.3%)	86.0
M	9	4.24(47.1%)	3.00(33.3%)	0.71(7.9%)	80.4
N	4	2.18(54.3%)	1.78(44.4%)	0.04(1.1%)	98.6
O	6	3.33(55.5%)	1.34(22.3%)	1.04(17.3%)	95.1
P	5	3.71(74.1%)	0.60(12.0%)	0.49(9.8%)	74.1
Q	10	6.82(68.2%)	1.54(15.4%)	0.94(9.4%)	83.6
			Mean		85.7
			Standard deviation		7.0

*Used in principal components analysis

Table 12.4 Eigenvalues of the three largest components (before rotation) for each respondent

RESPONDENT	No. OF COMPONENTS	CORRELATION BETWEEN COMPONENTS 1 and 2	COMPONENTS 1 and 3	COMPONENTS 2 and 3
A	2	0.39		
B	2	-0.13		
C	1	n/a		
D	3	0.37	-0.09	0.05
E	2	0.16		
F	2	-0.03		
G	3	-0.19	-0.01	-0.18
H	3	-0.08	0.25	-0.02
I	3	-0.18	0.52	-0.26
J	2	0.21		
K	2	0.48		
L	2	0.01		
M	2	0.02		
N	2	0.01		
O	3	-0.23	-0.24	0.23
P	1	n/a		
Q	2	0.14		

Table 12.5 Component correlations after oblique rotation

	BOTH		
AND	Evaluative Components	Intermodal Components	Preference Components
Evaluative Components	n/a	6	14
Intermodal Components		n/a	0
Preference Components			n/a

Table 12.7 Components of more than one category

RESPONDENT	COMPONENT TYPE	
	INTERMODAL	PREFERENCE
A	2	0
B	1	0
C	0	1
D	0	2
E	1	0
F	1	1
G	1	2
H	1	1
I	1	1
J	0	2
K	1	1
L	0	0
M	1	1
N	1	1
O	1	1
P	0	1
Q	0	1
No. of components	12	16
No. of respondents	11	13

Table 12.6 Components according to respondent

CLASS OF CONSTRUCT	No. OF TIMES AVAILABLE IN PRINCIPAL COMPONENTS ANALYSIS (ALL RESPONDENTS)	No. OF TIMES A LEADING CONSTRUCT IN INTERMODAL COMPONENTS	No. OF TIMES A LEADING CONSTRUCT IN PREFERENCE COMPONENTS
Transport contacts	18	7	4
Depot delays	14	1	6
Urgency	12	5	2
Monitoring and control	12	-	6
Cost(other than related to time)	11	4	4
Frequency of departure	10	2	2
Documentation	10	1	4
Final delivery	9	-	3
Clearance	8	1	3
Distance versus time	7	-	5
Product	6	3	2
Time (other than related to distance or cost)	6	-	3
Shipper (other than product)	5	-	2
Consignee's influence	5	1	1
Cost versus time	4	2	1
Security, damage, loss	4	-	3
Transport equipment	1	-	-
Flexibility	1	-	-

Table 12.8 Construct classes as leading constructs for intermodal and preference components

PREFERENCE FOR ROUTE-SERVICES	No. OF CASES	MEAN	STAN-DARD DEVI-ATION	T-TEST CONTRAST	T-VALUE	DEGREES OF FREE-DOM	2-TAILED PROBAB-ILITY
BOTH MODES COMBINED							
a) Most preferred	32	-0.74	0.56	a) v b)	-4.06	92	<0.001
b) Neutral	62	-0.15	0.72	a) v c)	-10.06	64	<0.001
c) Least preferred	34	0.96	0.79	b) v c)	7.03	94	<0.001
AIR ONLY							
a) Most preferred	16	-0.77	0.48	a) v b)	-3.06	44	0.004
b) neutral	30	-0.16	0.71	a) v c)	-6.41	32	<0.001
c) Least preferred	18	0.71	0.81	b) v c)	3.89	46	<0.001
SURFACE ONLY							
a) Most preferred	16	-0.71	0.64	a) v b)	-2.65	46	0.011
b) Neutral	32	-0.14	0.73	a) v c)	-8.30	30	<0.001
c) Least preferred	16	1.24	0.69	b) v c)	6.35	46	<0.001

Table 12.9 T-tests of difference between preferences for aggregated preference component scores

MODE	No. OF CASES	MEAN	STANDARD DEVIATION	T-VALUE	DEGREES OF FREEDOM	2-TAILED PROBABILITY
Air	64	-0.07	0.88	-0.76	126	0.45
Surface	64	0.06	0.99			

Table 12.10 T-test of difference between modes for preference component scores

PREFERENCE FOR ROUTE-SERVICES	NO. OF CASES	MEAN	STAN-DARD DEVI-ATION	T-TEST CONTRAST	T-VALUE	DEGREES OF FREE-DOM	2 TAILED PROBAB-ILITY
BOTH MODES COMBINED							
a)Most preferred	28	-0.15	0.87	a) v b)	-0.61	70	0.54
b)Neutral	44	-0.02	0.92	a) v c)	-1.40	50	0.17
c)Least preferred	24	0.22	1.04	b) v c)	0.97	66	0.34
AIR ONLY							
a)Most preferred	16	-0.80	0.28	a) v b)	0.75	34	0.46
b)Neutral	20	-0.88	0.40	a) v c)	-0.75	26	0.46
c)Least preferred	12	-0.70	0.40	b) v c)	1.26	30	0.22
SURFACE ONLY							
a)Most preferred	12	0.70	0.60	a) v b)	0.01	34	0.99
b)Neutral	24	0.70	0.70	a) v c)	-1.90	22	0.07
c)Least preferred	12	1.14	0.53	b) v c)	2.35	34	0.03

Table 12.11 T-tests of difference between preferences for aggregated intermodal component scores

PREFERENCE FOR ROUTE-SERVICES	No. OF CASES	MEAN	STANDARD DEVIATION	T-VALUE	DEGREES OF FREEDOM	2-TAILED PROBABILITY
MOST PREFERRED						
Air	16	-0.77	0.48	-0.29	30	0.78
Surface	16	-0.71	0.64			
NEUTRAL						
Air	30	-0.16	0.71	-0.07	60	0.94
Surface	32	-0.14	0.73			
LEAST PREFERRED						
Air	18	0.71	0.81	-2.05	32	0.05
Surface	16	1.24	0.69			

Table 12.12 T-test of differences between modes by preference for preference component scores.

CHAPTER 13. THE SOCIAL PERCEPTUAL APPROACH

13.1 Introduction

The preceding four chapters have analysed aspects of the social perceptual approach introduced in chapter five. Chapters nine and ten examined aspects in the technological system under the two broad headings of the properties of the product and the properties of the route-service. Chapter eleven examined socio-organisational variables which constrain the respondents' decision making, and chapter twelve presented the patterns of cognitive structures which respondents form of the transport system. This chapter consolidates the results to present an implicit theory which the group of shipping managers may be assumed to hold towards a particular transport system. In terms of the organisation theory outlined in chapter four it is presented as a group 'definition of the situation' or 'subjective rationality', that is, a rationality relative to the frame of reference of shipping managers. It is not the rationality of the firm or necessarily of any assumed single'significant' decision maker.

Each respondent in the survey has his own implicit theory which may differ from that of any other respondent. It would be possible from the results obtained in this study to analyse the data of each respondent in much greater detail than presented in this work. However, although we are concerned with the general patterns of cognitions found in the group of respondents, it should be emphasised that patterns have been established for individuals before aggregation.

After formulating an implicit theory of freight modal choice, the chapter explores some of the implications for change concerning the issues in international transport raised in chapter one: the replacement of scheduled air services by express surface vans from Britain to W.Europe; total distribution costing; and the through transport concept.

13.2 The implicit theory

Based on the findings of the previous four chapters it is possible to hypothesise an implicit theory which the group of shipping managers has of the freight transport system presented in this work. The relevant findings discussed in this section are summarised in table 13.1. This chapter presents only the basic findings since each result has been presented in detail in the preceding chapters.

Shipping managers generally perceive surface transport as being slower than air transport. It has a mean fastest most likely door to door transit time of 6.1 days compared with 2.9 days for air, and a mean slowest time of 7.2 days compared with 3.4 days for air. Thus, the time differential is concerned with absolute savings in time (air is 3 to 4 days faster) rather than with a savings in variability between the fastest and slowest most likely times for each mode. Only surface transport is perceived as having a noticeably longer transit time with increasing distance.

SURFACE TRANSPORT		MODAL CONTRAST	AIR TRANSPORT		
INTRAMODAL PREFERENCES		INTERMODAL PREFERENCES	INTRAMODAL PREFERENCES		COGNITIVE STRUCTURES
Depot delays, cost Monitoring/control Documentation Final delivery Distance v time Customs clearance Security/damage/loss	SURFACE ONLY Transport contacts	Air better than surface in general Surface more differentiated Differentiation between least rather than most preferred services Transport contacts Urgency Cost	AIR ONLY Customs clearance	Depot delays, cost Monitoring and control Documentation Final delivery Distance v time Customs clearance Security/damage/loss	
Mean variability of transit time 2.3 days Mean fastest transit time 6.1 days Mean slowest transit time 7.2 days Nearly 60% route-services depart ≤ 2 per week		Surface greater variability of transit time than air Surface has slower 'fastest' transit time Surface has slower 'slowest' transit time Difference between slowest and fastest transit time for surface increases with distance but not for air Frequency of departure much higher for air than surface Frequency of departure:surface decreases with distance but not air	Mean variability of transit time 1.5 days Mean fastest transit time 2.9 days Mean slowest transit time 3.4 days > 80% of route-services depart daily		MEASURES OF THE TRANSPORT SYSTEM
48% of route-services through forwarder 85% of route-services have 3 or more transport contacts 8 respondents use same main transport contact for all route-services 22% of route-services have same main transport contact ≥ 5years 41% of route-services have > 75% regular, repeat orders		Much greater use of forwarder intermediary for air More transport contacts used for surface than for air Air transport contacts used for wider range of route-services Air transport contacts retained for longer period Surface used more for regular, repeat orders	92% of route services through forwarder 15% of route-services have 3 or more transport contacts 22 respondents use same main transport contact for all route-services 44% of route-services have same main transport contact ≥ 5 years 17% of route-services have > 75% regular, repeat orders		SOCIO-ORGANISATIONAL INFLUENCES
Mean international distance 629km Mean no. of countries using mode 5.1 Mean no. of consignments 18 Mean most likely consignment weight 1978 kg/mean lightest consignment weight 417 kg		Distance does not influence modal use No. of countries for surface not affected by v/w ratio /No. of countries for air increases with v/w ratio Propensity to use air consignments increases with v/w ratio Surface consignments are heavier, although a 'competitive area' by weight exists	Mean international distance 656km Mean no. of countries using mode 4.6 Mean no. of consignments 22 Mean most likely consignment weight 86 kg/mean heaviest consignment weight 766 kg		MODAL USE

Table 13.1 Summary of findings in the analysis

The perceived transit times are 'measures' of the transport system held by the group of shipping managers. Similar 'measures' may be extracted from the repertory grids. The results of the repertory grids suggest that air transport is perceived as better than surface transport in general terms. Unlike the perceived transit times, surface transport is more differentiated than air in terms of cognitive structures, and the extremity of the surface differentiation appears to be in the isolation of least preferred surface route-services from all others.

The social perceptual approach assumes that such 'measures' are made through a socio-organisational 'filter'. More transport contacts are used for surface than for air transport, with 85% of surface route-services having three or more transport contacts compared with 15% of air . Air transport contacts are retained for longer periods than surface with 44% of air route-services having the same main transport contact for five years or more compared with 22% of surface. Shipping managers appear much more likely to use than same transport contact for more than one route-service for air than for surface transport. All such factors are likely to influence the discriminablity of the shipping manager in that he will tend to be able to discriminate more easily between surface services. The difference is further reinforced by the fact that shipping managers are much more likely to view the transport system through the filter of an intermediary freight forwarder for air than for surface transport (92% of air route-services compared with 48% of surface). In the case of surface transport, shipping managers are much more frequently in direct contact with the carrier.

According to personal construct theory the elements, or in this work the route-services, should cover an appropriate 'range of convenience' of the shipping manager. Each individual's constructs have a specific 'focus of convenience'. The results suggest that the focus of convenience in the implicit theory of shipping managers is different for air and surface transport. It is clear that many shipping managers attach a route-specific meaning to surface transport and focus on one route-service at a time. This is evident both in their tendency to use different transport contacts for each surface route-service and in the high degree of differentiation between surface route-services compared with air in the formal relationships in the cognitive structures.

It may be that the range of convenience for air extends beyond the range of W. Europe, and that one or two forwarders may cover the entire world for air freight for many shipping managers. If this were the case, then shipping managers might be said to adopt a terminal-specific approach to air freight in contrast to the route-specific approach to surface transport. In other words, they perceive air freight as movement from a terminal (eg Heathrow Airport) rather than along country-to-country routes. In any event, there would appear to be a tendency to adopt a terminal-specific approach to air freight as far as the eight W. European countries in the study are concerned.

Before considering the implications for the modal choice of the group of shipping managers, it is first necessary to consider modal use. Modal use shows that surface consignments are heavier than those carried by air on average (1978kg compared with 86kg mean) although there is a competitive

area in terms of weight for the group as a whole in the survey (approximately from 400kg to 750 kg). Distance does not appear to influence modal use. The value/weight (v/w) ratios of the products under consideration suggest that all the exporters in the survey are predominantly surface users; however, they use air as frequently as surface in terms of numbers of consignments (22 per year per air route-service compared with 18 for surface). An increase in the use of air appears to be positively associated with the v/w ratio both in terms of the relative number of consignments for air and surface and in terms of the number of countries to which goods are sent by air.

The modal choice from the standpoint of the shipping manager appears to be associated predominantly with urgency, cost and transport contacts according to the repertory grids. The selection of urgency conforms with the findings of the Civil Aviation Authority (1977) described in chapter six, cost is an obvious distinction (chapter six describes how air is about three to four times more expensive than surface transport), and there are considerable differences between the modes in the patterns of relationships with transport contacts as outlined in this section already. Some of the categories which might be expected to be reasons for intermodal choice such as monitoring and control or depot delays appear to be associated more with intramodal choice according to the repertory grids.

It is as if the reasons for modal choice are often outside the normal problems which beset a shipping manager, based on his particular combination of tasks described in chapter six. Such problems as those of monitoring and control, documentation etc. tend to be perceived as intramodal factors. Intermodal choice appears to be perceived as the choice between two isolated channels which are often not compared except in terms of direct transport cost. It appears to be taken for granted that 'normal' consignments go by air, with a greater relative frequency of air shipments when goods have a higher v/w ratio.

In terms of time savings associated with cost, it would appear to be of value for the shipping manager to search for an appropriate surface carrier for at least some of the urgent air consignments since, in such a competitive surface market, it might be possible to find surface carriers who depart on such dates that the door to door transit time is minimised. However, this could require considerable search activity on a route-by-route basis and it is unlikely that the effort would be appreciated since the results would not be clearly perceived by other socio-organisational groups as a contribution to an urgent consignment problem. If urgent consignments were sent by surface transport, however fast, they would be perceived as going by the 'normal' mode.

The implicit theory of the group of shipping managers proposed in this section is expressed as a diagram in figure 13.1 The implicit theory is considered in the context of the issues described in the introduction in the following sections.

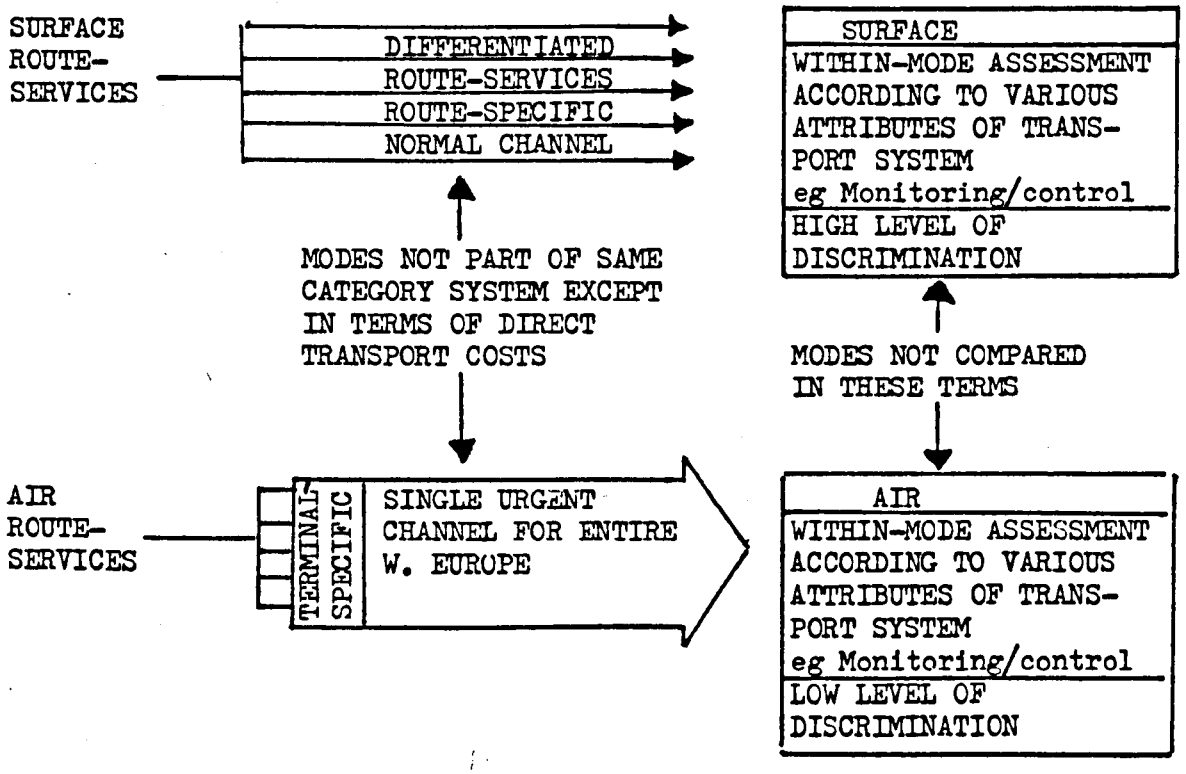


Figure 13.1 Implicit theory of group of shipping managers

13.3 The implicit theory applied

This section applies the implicit theory to a number of current issues in the area of international freight transport. The issues, which were introduced in chapter one, are the replacement of scheduled air services by express surface vans from the United Kingdom to W. Europe; total distribution costing; and the through transport concept.

13.3.1 The use of express vans

The survey undertaken for this work suggests that shipping managers adopt a quite different approach in their perception of and their contact with the two different modes to W. Europe. The results suggest that the shipping manager's contact tends to be more route-specific for surface movements and that he is more likely to use the same transport contact for more than one air destination than for more than one surface destination.

W. Europe, and in particular the EEC, may be considered as a hybrid market which, for the United Kingdom, is changing from a traditional export market into a home market as a result of the combination of the development of a free trading zone and geographical proximity. In the light of this supposition, this section examines the approach of shipping managers to the W. European market with regard to the relative merits of air and fast surface services for urgent consignments.

	Austria	Belgium	France	Italy	Netherlands	Spain	Switz-erland	W.Germany
No. of respondents for all types of air (=100% per country)	45	49	62	48	59	43	52	62
of which (%)								
Scheduled air	91.1	100.0	93.5	93.8	93.2	93.0	94.2	93.5
Charter	4.4	-	3.2	2.1	3.4	2.3	-	4.8
Consolidated	2.2	-	-	-	1.7	-	-	-
No. of respondents for all types of surface (=100% per country)	44	66	81	58	73	45	57	80
of which (%)								
Road groupage	61.4	62.1	55.6	60.3	65.8	68.9	66.7	63.8
Road part load	34.1	24.2	30.9	25.9	24.7	22.2	22.8	26.3
Express van	-	9.1	12.3	5.2	9.6	2.2	3.5	5.0
Rail groupage	4.5	4.5	1.2	8.6	-	6.7	7.0	5.0

Sample size: 98 respondents using 924 route-services (420 air and 504 surface). Some air submodes total less than 100% because respondents uncertain of category

Table 13.2 Submodes used by respondents for each destination country

What is it that explains the limited success of express surface services according to the results of the survey? Table 13.2 shows the submodes used by the original 98 respondents who completed the first questionnaire. Table 13.2 shows that there is very little use of express vans compared with the use of scheduled air, suggesting that the actual or perceived speed of the fastest road services combined with their generally lower costs is insufficient to make them popular with shippers. Chapter ten (table 10.6) showed that express vans are perceived as a faster mode than air transport, although the result is based on a very small sample owing to the infrequent use of express vans. The general lack of popularity is despite the apparent popularity with shipping managers who are actual users of express vans (see table 13.3). Let us consider the apparent reluctance to use express vans from the standpoint of the social perceptual approach to freight modal choice.

Submode	Most Preferred	Least Preferred
Road groupage	50 (64.9%)	42 (70.0%)
Road part load	17 (22.1%)	9 (15.0%)
Rail groupage	2 (2.6%)	8 (13.3%)
Express van	8 (10.4%)	1 (1.7%)
Total	77(100%)	60(100%)

Table 13.3(a) Frequency of each surface submode as most preferred or least preferred service

Submode	Total no. of route-services (=100%)*	Most Preferred	Least Preferred
Road groupage	316	15.8%(50)	13.3%(42)
Road part load	133	12.8%(17)	6.8%(9)
Rail groupage	22	9.1%(2)	36.4%(8)
Express van	33	24.2%(8)	3.0%(1)

Table 13.3(b) Preferences as a proportion of total usage of surface submodes

*Unexplained percentage refers to route-services where no preference was stated

Sample size: 84 respondents using 504 route-services. Shortfall in total because some respondents unable to state preference

Table 13.3 Respondents' preferences for surface submodes

The person responsible for arranging W. European transport in an exporting company is usually the same person who is responsible for other international transport. He is much less frequently the person responsible for domestic transport. In the survey associated with this work only 30.4% of 45 respondents used in the analysis made important decisions regarding domestic transport. This is a similar result to that in the much larger

survey by Davies and Gray (1980). It is possible that the transfer of urgent consignments from surface to air is a traditional international distribution response appropriate to intercontinental movements, but which is less appropriate when applied to W. Europe where the time differential is much smaller (a perceived 3 to 4 days on average). A typical domestic market response would be to turn to hire and reward carriers offering express road consolidation services and who undertake formal monitoring of their own transit performance (eg Freight Management 1977). In this respect it is possible that more use would be made of express van services to W. Europe in place of air transport if it were perceived as a domestic market by senior management.

However, many shipping managers already have an existing network of contacts at an airport because of their worldwide air transport or, in other words, their approach to air transport is terminal-specific. If an air service is used for an urgent consignment, prompt action on the part of the shipping manager may be seen to be undertaken, but at the same time there is no need to search for new carriers (eg express van operators or road groupage operators with a departure on a specific day) or to establish a new network of contacts with the international transport industry. Thus the use of air transport for urgency is more convenient for the shipping manager, other factors being equal.

Furthermore, since air transport has a reputation for carrying urgent consignments, shippers (especially consignees) may be geared to giving considerable attention to air consignments, even possibly to the extent of having their own employees based at or near airports, or at least to having an established rapid delivery surface system between their premises and an airport. Such a system may be understandable for intercontinental movements where there is a high time differential between air and surface transport, but one must ask whether or not it merits the high cost involved, possibly not identifiable, for intra-European movements. On the other hand, if the high quality service between the exporter and the airport already exists for intercontinental movements, then the marginal cost of organising intra-European movements by air may be low.

Surface operators have tended to establish services from their own depots and have advertised this fact as being a great advantage, since it avoids the congestion and other problems associated with larges terminals. Thus, the surface transport industry fosters the differentiated route-specific perception that shipping managers tend to have of it. However, it is noteworthy that shipping managers turn to a service which operates through large terminals (eg Heathrow Airport) when urgency is required. Where a scheduled air service is used it is only the flight which is scheduled and not the door to door movement, so that there is presumably no guarantee of door to door urgent treatment of consignments. It is more likely that the established support service by the exporter and/or importer is the key to many successful fast deliveries by air. It is possible that the level of service by surface transport would be much higher if similar support were given to surface movements. However, since surface operators tend to operate between a large number of individual depots it is more difficult for a shipper to establish such a service which is only likely to be cost-effective or convenient if it covers all or most countries of origin or destination, as in the case of airports.

In the short run it might be to the benefit of surface carriers to present

themselves in the undifferentiated image of air freight if they wish to gain traffic from air. What would be the effect if shipping managers were able to approach express van operators through their usual air freight forwarder, rather than establish yet another contact with a surface road operator which is perceived as another potential differentiated surface service in terms of monitoring and control, depot delays etc.?

In this context it is of interest to consider the text of two recent advertisements for express surface services to W. Europe. In an area where there is little research, advertising statements may be seen as the culmination of the 'research' of transport operators. In some cases, of course, they are the result of formal private market research studies unavailable to the public.

The first advertisement (Freight News Weekly 29th February 1980) offers a conventional surface transport approach with such statements as 'total door to door security', 'faster than airfreight', '[designed] for shippers to avoid Heathrow, the overcrowded continental airports and mammoth TIR terminals', and 'no transhipment'. It will be noted that these statements tend to conform with the leading constructs associated with intramodal rather than intermodal differentiation. The company offers a standard surface weight/volume ratio for pricing of 100kg = 0.36 cubic metres.

The second advertisement for an express surface service (International Freighting Weekly 2nd April 1980) appears to accord with the hypothesis that surface carriers should present themselves in the image of air freight if they wish to establish an express service. It states, 'air freight getting too expensive?', '8 branches in the UK including one at Heathrow Airport' (the author's underlining), '5 departures per week to most destinations', 'minimum rates only half of air freight charges'. The company offers a standard air weight/volume ratio for pricing of 100kg = 0.7 cubic metres.

The first advertisement appears to be for a fast surface service whereas the second advertisement is in effect for a cheaper 'air' service. It is possible that the second advertisement more accurately assesses the approach adopted by shipping managers based on the findings described in this work. Whereas surface operators appear to have established a route-specific relationship with shipping managers, the same air forwarder tends to serve a number of routes for a shipping manager on a terminal-specific basis. The export shipping manager traditionally turns to air freight for urgency, expects a high frequency of departure and wishes to send the goods through what is for him an established channel of urgency. It is likely that air transport is used as a convenient mode.

13.3.2 Total distribution costing

During the past two decades a number of commentators (Lewis et al 1956, Sealy and Herdson 1961, Stanford Research Institute 1963, Smith 1974) have examined the possibilities for taking 'total' distribution costs into account rather than only the transport costs when comparing transport modes and, specifically, when comparing air freight transport with sea freight transport.

A typical total distribution cost model case study is given by Smith (1974) and is reproduced in figure 13.2. According to the formulation of the

Product	Photographic apparatus
Origin	New York
Destination	Cologne
Money	Dollars
Weight unit	Kilos

Mode of transport	Sea	Air
INPUT		
Period of credit (days)	90	30
FOB value	9.4	9.4
Final selling price	12.4	12.4
Value of goods in transit	Final price	Final price
Initial weekly sales	100	100
Minimum weekly sales	75	75
Maximum weekly sales	125	125
Growth rate %	10	10
Economic order quantity to be used	Yes	Yes
Set-up cost	200.0	200.0
Stockout cost	12.4	12.4
Service given %	95	95
Average transit time (days)	17	3
Minimum " " "	15	2
Other order processing time (days)	1	1
Gross weight	2.2	2.1
Net weight	2.0	2.0
Freight rate	0.12	0.25
Packaging cost	0.03	0.01
Insurance cost	0.045	0.015
Warehouse cost	3.1	3.1
Duty type	CIF	CIF
Duty rate %	9	9
Discount rate %	10	10
OUTPUT		
Economic order quantity	684	684
Re-order point	1168	329
Distribution costs		
Warehouse cost	21,737	10,023
Stockout cost	19,823	19,784
Transport cost	8,774	16,838
Insurance cost	14,058	4,522
Packaging cost	1,994	641
Stock in transit cost	2,509	642
Stockholding cost	8,270	3,813
Duty cost	30,350	29,112
Total cost	107,515	85,375

Figure 13.2 Total distribution cost model case study
Source: Smith (1974)

model, the total cost by sea is higher than that by air, although the freight rate by air is more than twice that by sea. The fundamental difference between air and sea is the transit time and the insurance cost. The saving of $22,140 for the total cost by air over sea applies to a five year period. The example is typical of a number of total distribution analyses which have appeared in the literature in recent years (eg Slijper 1977, Wentworth and Christopher 1979). It can be seen that total distribution models are a specific although limited application of the logistics approach.

Total distribution costing is more relevant to intercontinental movements than to intra-European movements owing to the lower time differential of the latter. Nevertheless, analyses have been applied to intra-European movements. Furthermore, it is assumed that the comments made about air freight in this analysis apply to intercontinental movements. It is also possible that intercontinental surface movements are often perceived as route-specific owing to the conference system based on specific routes (see chapter six).

In recent years a number of airlines have developed distribution advisory services, supported by computer-based models, to explain to shippers the benefits of using more air transport. Despite the offer of free computing time without obligation by the airlines, there appears to have been some resistance to total distribution analyses on the part of shippers. An article in 'Freight Management' (1975) claims that the main inhibitions to adopting a total distribution approach are:

'(i)management is unable to measure the costs and benefits of alternative distribution systems to determine the value of change. This problem basically concerns the availability of data and techniques.
(ii) the maintenance of traditional selling practices and trade procedures, especially in export markets, constrains the introduction of a total distribution approach. This is a facilitation problem.
(iii)the necessary decision making apparatus, and trained personnel do not exist - the old problem of responsibility without power! ' (p24)

The author of the 'Freight Management' article suggests that the failure to take into account total distribution costs is the result of inadequate links between the strategic decisions of senior management and the tactical decisions of line managers. He states that,

'Fragmentation of responsibility and inadequate strategic planning are undoubtedly principal factors preventing the effective integration of distribution functions into a total system. It is the task of group management to avoid conflict and prevent high cost and poor service. This depends on being able to:
(i)get each function to think and operate in total distribution terms rather than parochially
(ii)devise an equable division of distribution savings by which functions incurring high costs are compensated, if only notionally, with the benefits achieved elsewhere.

'It is the transport and shipping manager to whom these points apply most forcibly' (p25).

The author of the 'Freight Management' article criticises the approach of transport and shipping managers to distribution costs, stating that,

'All the time transport is not linked with other distribution functions and is regarded as a cost centre, transport managers will opt for low transport, rather than low distribution cost. It is wholly understandable that they should regard the objectives of the job in this way. It is only if they are provided with a different brief that such attitudes can change. However, the complication then arises that relatively few transport managers have received anything more than a superficial training in distribution concepts or have substantial knowledge of premium transport except on an emergency basis...' (p25)

Airlines and freight forwarders have had limited success in marketing the total distribution cost concept since,

'The problem was not making the case which some airlines managed very effectively, so much as finding the right group of people to which to present it.

'The industry traditionally sells its product to transport managers but, since these individuals had responsibility but comparatively little power for distribution decisions, such selling is of limited value. Airlines and forwarders could not break through to the significant decision makers, because, on occasion, of internal conflict, but more often because these persons had not coalesced as an identifiable group within a company' (p17).

In order to market successfully the total distribution concept,

'Marketing must aim to influence the strategic decisions of companies. Airlines and forwarders have therefore to gear themselves to talk to management knowledgeably about distribution needs. They must be as at home with the accountant and the inventory analyst as with the transport manager' (p27)

The case presented by the author of the 'Freight Management' article may be examined in terms of the social perceptual approach. An explicit theory of relevant costs has been developed by academics (Stanford Research Institute and others) which has been adopted by the airlines to promote more sales. Despite the normative presentation of the approach, the author of the 'Freight Management' article assumes that it should be the theoretical stance of the 'significant decision makers' who, in his opinion, exist but are sometimes difficult to identify. The approach is resisted by shipping and transport managers who are assumed to have implicit theories which do not recognise the benefits of total distribution costing. Instead, they are likely to take into account only the cost of transport when comparing modes.

The author of the'Freight Management' article is critical of senior management, both in the way they measure objects of the transport system (their discriminability) and in the objects which are considered in their implicit theories. In the former case, management is'unable to measure the costs and benefits of alternative distribution systems' owing to a lack of 'data and techniques', and in the latter case the wrong objects are taken into account because of the 'maintenance of traditional selling practices and trade procedures'. In this respect the author is applying the same criticisms as NEDO (1977) described in chapter six, where terms of sale based on f.o.b (free on board) or c.i.f (cost, insurance, freight) agreements may result in a divided responsibility for the total transport between the exporter and the importer, and therefore in an unsuitable setting for the institution of total distribution costing. If the exporter sells on f.o.b terms so that the importer is responsible for the international transport, it is likely that the institution of total distribution

costing would prove very difficult.

The author of the 'Freight Management' article states that transport or shipping managers will inevitably prefer the lower cost transport mode if transport is not linked to other cost functions. They will take only transport costs into account. The author states that airlines and air forwarders should aim to influence the 'significant decision makers' who are likely to be more highly placed in companies than shipping managers. This suggestion is supported by the evidence of the current work which has identified that shipping managers often tend not to be solely responsible for modal choice between air and surface.

However, another problem not identified by the author of the 'Freight Management' article is the differential perception of shipping managers towards air and surface transport. Total distribution costing depends to a large extent on a route-specific approach. It is necessary to know the total costs of an entire movement from supplier to consignee along a particular channel if one is to include such costs as rates of duty, overseas warehousing, final delivery etc. However, the results of this study suggest that shipping managers do not perceive air freight in route-specific terms.

The organisational implications of a more senior manager imposing a route-specific approach to air freight upon a shipping manager should also be considered. Since the air freight industry has traditionally not presented itself in a route-specific manner, a shipping manager may have great difficulty in establishing such a relationship with a reluctant air transport industry. In this respect, the operational side of the air freight industry would not appear to be instep with the research or marketing side which has developed total distribution costing. Total distribution costing has tended to be advocated by the scheduled airlines. Paradoxically, it is another branch of the air freight industry which has introduced a route-specific approach where total distribution costing may be possible. In recent years a number of independent air charter companies have become established which operate on a route-specific basis (from the standpoint of the shipper) to such countries as Zambia or Nigeria. Such charter services have often been set up in the face of opposition from the scheduled airlines. From 1981 it is possible that some scheduled airlines will operate door to door services to and from points in close proximity between Britain and W. Europe (International Freighting Weekly 10.9.80), which may be considered as a tentative route-specific approach.

The total distribution cost approach may run counter to the established implicit theory of the group of shipping managers. Furthermore, it requires a degree of discriminability (available data) which may not be associated with the requirements of any established implicit theory of any relevant organisational group. The complaint of insufficient data on the part of researchers is fairly common in freight transport studies (see chapter two), and this may often result from the failure of the researcher to reconcile <u>his</u> theory with the implicit theory of the relevant organisational personnel.

When this example is compared with the preceding example concerning

express vans, it can be seen that the social perceptual approach suggests that similar reasons may prevent air freight from declining in its competition with express vans and, at the same time, prevent air freight from increasing its market share compared with surface transport in general.

13.3.3 The through transport concept

The through transport approach proposed by NEDO (1977) advocates that either the buyer or the seller of the goods being transported (but preferably the seller) should be responsible for the entire transport, thus avoiding a disjointed delivery service. NEDO claims that too many British exporters regard international transport to W. Europe as a series of disjointed activities with agents or forwarders linking the segments. NEDO claims that [illegible] export performance could be improved through the adoption of the through transport concept resulting in an improved level of customer service.

The results in chapter eleven which examined socio-organisational constraints suggest that the through transport concept has not been universally adopted by the British exporter. 38.2% of all route-services in the survey had f.o.b terms of sale and 27.3% had c.i.f terms of sale.

On the face of it this would not appear to be a modal choice problem. However, this section will present possible impacts of the adoption of the through transport concept on the shipping manager's modal choice. This is important since the shipping manager would play an important role in the introduction of such an approach. Since this section has a theme in common with the preceding two sections it is not considered in such detail.

If a through transport approach were to be imposed on a shipping manager by more senior management, the social perceptual approach suggests that, since surface services are generally perceived as route-specific and differentiated, there would be no great difficulty in extending control along the channel of transport. However, in the case of air transport there would appear to be a problem in introducing a through transport approach. Table 11.1(a) of chapter eleven showed that only 23.8% of route-services with delivered domicile terms of sale were air, in contrast to approximately 50% for each of the other three terms of sale considered (ex works, f.o.b, c.i.f). An alternative interpretation of the same data is that 10.8% of air and 25% of surface route-services were used for goods sent on delivered domicile terms of sale. Such results suggest either a reluctance on the part of exporters to send goods on delivered terms by air, or a reluctance on the part of some importers to accept such consignments.

It has already been indicated that air transport appears to be perceived in terminal-specific terms. Such an approach would not appear amenable to achieving the degree of knowledge and door to door control over a route-service required for the through transport approach. Therefore,

what is to become of the apparently large number of urgent consignments? Either the exporter may have to revert to sending such consignments on f.o.b or c.i.f terms, which may be to the detriment of his image as a 'delivered price' exporter, or it may result in a greater use of express surface services on a route-specific basis. Of course, it may be that 'urgency' would be redefined or the levels of customer service resulting from the use of air transport would be more closely examined.

In the survey, respondents were asked to give the 'most likely' lead time from their firm's receipt of the customer's order to despatch from their premises. As in the case of transit times, respondents were provided with no 'anchor' against which to assess the time, other than being required to state the lead time in weeks. The mean lowest most likely lead time for air was 4.3 weeks (median 2.1 weeks) and for surface transport 5.6 weeks (median 3.7 weeks). A much higher proportion of lead times of air route-services (41.8%) than surface (12.8%) were one week (to nearest week). The nature of urgency would appear to be associated with such times, although consignments may be defined as urgent for a number of reasons - for example, because goods are samples, or required for a trade fair, or for a production breakdown in the destination country, or because an order is late. All such reasons were given by respondents in the original elicitation stage of the survey. The nature of urgency is a complex subject on which this study can only throw partial light, but it is possible that urgency in terms of modal use could be redefined in the face of an over-riding theory such as the through transport approach.

Thus it is possible that a differentiated approach to freight transport modes may have repercussions in the activities of the exporting company far removed from considerations of modal choice.

According to the authors of the NEDO (1977) report, 'European industry without a UK sealeg in all surface movement, exploits through transport better than we do' (p19). It is probably not the physical existence of the sealeg in itself that is a barrier to through transport, but the perception that it creates of W. Europe being an area of international transport. This would not matter if all shipments were by surface transport but, as stated in section 13.3.1, the typical international transport response is to use air for urgent consignments, which may be detrimental to the introduction of the through transport approach.

The social perceptual approach has been applied to three international distribution issues. It would appear that the theme of differential perceptions of the two transport modes of air and surface less than full load transport is relevant to all three topics.

CHAPTER 14. SCOPE FOR FURTHER RESEARCH

Chapter one mentioned the desire among researchers (eg Meyburg in Hensher and Stopher eds 1979) to develop behavioural models in the analysis of goods movements. Chapter two showed that most existing models either assume the firm to be the behavioural unit or equate the perceptions of an individual in a firm with the behavioural intentions of the firm as a whole. Many models of freight modal choice ignore the complexities of modern industrial organisations. The approach presented in this work suggests that an understanding of freight flows may be obtained in terms of the modal choice of socio-organisational groups. Such groups cut across the boundaries of shipper firms so that it is conceivable that, in a major study, three or four levels of groups would be associated with the same firms (eg shipping managers, export marketing managers, inventory controllers).

The detailed empirical research was restricted to one socio-organisational group owing to resource constraints. The implicit theories of other groups were based on assumptions from published material. The emergent dominant theory of freight transport demand appears to be that the movement of goods is part of a coordinated logistical system (in international distribution this is manifested in the through transport concept and total distribution costing). This work has tended to assume that such an approach would be introduced to firms through more senior management than shipping management and has attempted to show that the implicit theory of shipping managers might have difficulty in accommodating such an approach.

More research is required into the identification of other socio-organisational groups associated with freight modal choice decisions both within the shipper company and in other institutions along the trade and transport channels. An example of such research is that of Davies and Gray (1979 and 1980). By understanding how different socio-organisational groups perceive a specific area of freight transport it might prove possible to gain a considerable understanding of the dynamics of change in the pattern of freight movements. An example of the potential for this approach was given when assessing the future of express surface services vis-a-vis air freight in chapter thirteen. It would appear useful for freight modal choice studies to undertake an organisational analysis of shippers prior to and in conjunction with the study of freight flows.

The social perceptual approach may also assist in the problem of the appropriate level of disaggregation and homogeneity which was discussed in chapter two. The approach presented in this work proposes disaggregation to the level of the socio-organisational group. Traditionally, aggregation has been in terms of firms, consignments or weight or volume. It is possible that socio-organisational groups maintain homogeneity for a higher level of aggregation of freight movements than other factors in terms of significant acts of decision making. Thus, it might be found that the behavioural patterns of a socio-organisational group associated with freight modal choice are similar for a wide range of products. The identification of appropriate groups of products would appear to be an area where further research is required.

There is scope for further research into the appropriate technique to use to make the concept of the social perceptual approach operational. In order to understand implicit theories it is necessary to use a technique which is able to establish a pattern of relationships at the level of the individual and then aggregate the pattern of relationships of variables, rather than obtain a picture of 'average man' based on the interrelationship of variables only at the aggregate level. The repertory grid approach was adopted in this work since it is directly associated with a theory which perceives the individual as a 'theorist'. It is also an approach which is explicitly comparative and is therefore highly suited to studies which involve choice. Furthermore, it is an approach which respondents appear to like because they play a large part in 'designing' their own questionnaires. Nevertheless, there are a number of multivariate techniques and, with developments in computer software packages, it is possible that another technique may prove more suitable. It is not intended that the social perceptual approach should be exclusively associated with the repertory grid technique.

However, it is considered important that the subjects of the study should provide their own content in terms of variables (or constructs). There is scope for research into the area of personalised questionnaires in freight modal choice studies. The preparation of individual questionnaires in this research was a time-consuming activity which was acceptable bearing in mind the exploratory and small-scale nature of the research. It is considered that it would be relatively easy to prepare personalised questionnaires with the use of word processors. Word processors are essentially a combination of computer and typewriter and are used in commerce to enable standard parts of letters to be stored in a computer memory, to which non-standard parts are added, and then a document is automatically typed which gives the impression of having been prepared individually. For personalised questionnaires the basic format (boxes, lines, headings etc) may be stored in the computer memory. The elements or route-services need be entered only once. It is clear from the research that the same constructs tend to be repeated by a number of respondents. Such statements may be accumulated in the memory and the appropriate ones extracted by the researcher for each respondent. When a new statement is obtained from a respondentit can be added to the memory. It was made clear in chapter seven that personalised questionnaires are not intended to be entirely personal to the extentthat the exact wording of respondents is used. This would present insurmountable difficulties in aggregation. Nevertheless, it proved feasible for each respondent to receive a personal combination of constructs closely associated with his own perceptions. The use of such techniques would probably make much larger scale personalised surveys feasible. An obvious danger in the use of word processors might be a tendency to employ an established statement rather than adopt a new one.

An area in need of further research is the investigation of the nature of urgency in freight transport. The extent of so-called urgent consignments in the study suggests that considerable additional

administrative, clerical and packing costs in addition to transport costs may be incurred in the name of urgency. Some administrative and clerical costs may be assumed to be as high (possibly higher owing to the exceptional circumstances) for a small urgent consignment as for a large 'normal' consignment. In addition, there is the general social cost of using a faster and higher fuel-consuming mode than necessary to be taken into account.

Many aspects of urgency go beyond the limits of freight transport and involve aspects of customer service, production etc. However, a particular aspect of urgency associated with freight transport is the possibly greater extent of shipper support given to the urgent mode. To what extent are modes compared equally when only transit time factors are taken into account? It is possible that air transport may receive 'excessive' shipper support compared with surface transport.

Examples of 'excessive' shipper support are found throughout freight transport. British Rail has a generally 'slow' image for freight movements yet it is used for postal and newspaper intercity movements which are urgent and generally successful owing to considerable shipper support between the depots (stations) and the points of origin and destination. Another example where variability of shipper support may be important to transport performance is the shipper's decision whether or not to deliver to groupage or consolidation depots in his own vehicles. The ultimate level of shipper support is of course the use of the shipper's own vehicles throughout the entire journey.

There would appear to be scope for further research into the relationship between the level of shipper support and the relative use of terminal-specific and route-specific modes. If the hypothesis that a high level of shipper support is associated with a terminal-specific approach is correct, this may introduce rigidities into the transport channel which prevent the introduction of route-specific logistical approaches. It also has implications both for the study of freight modal choice (which, as this work has shown, is often route-specific) and for the marketing of route-specific transport modes (eg surface transport to W. Europe).

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APPENDIX A

(Sheet 1 of 4)

CRANFIELD INSTITUTE OF TECHNOLOGY

SURVEY OF FREIGHT TRANSPORT SERVICES TO WESTERN EUROPE

(Please tick boxes as appropriate)

1. Do you have exports to W. Europe? YES ☐ NO ☐

If your answer is YES, please continue the questionnaire. If your answer is NO, kindly return it without further completion.

---

2. To which of the following countries did you send AIR shipments during 1978? (This refers only to your products, and not to documents, files etc which may be sent by air)

	Austria	Belgium	France	Italy	Nether-lands	Spain	Switz-erland	West Germany
Scheduled air freight								
Charter air freight								
Other								

Please specify "other".....

---

3. If you have not had AIR shipments during 1978 to at least two of the countries shown above, please go to question 12.

Assume you had to rank all your AIR entries in question 2 in order of overall quality, having weighed up all the relevant factors which form your opinion.

Which would you put in FIRST place (as the most preferred). Please tick only ONE box.

	Austria	Belgium	France	Italy	Nether-lands	Spain	Switz-erland	West Germany
Scheduled air freight								
Charter air freight								
Other								

---

4. Which would you put in LAST place (as the least preferred)? Please tick only ONE box.

	Austria	Belgium	France	Italy	Nether-lands	Spain	Switz-erland	West Germany
Scheduled air freight								
Charter air freight								
Other								

---

5. Please award each service a score for overall quality, where 9 = extremely good, 5 = neither good nor bad, and 1 = extremely bad. (Please circle the appropriate score)

AIR service ranked FIRST	extremely good	9	8	7	6	5	4	3	2	1	extremely bad
AIR service ranked LAST	extremely good	9	8	7	6	5	4	3	2	1	extremely bad

PTO

6. What is/are your main reason(s) for ranking the AIR service in question 3 in FIRST place?

.....

7. What is/are your main reason(s) for ranking the AIR service in question 4 in LAST place?

.....

8. Which of the following types of organisation best describes the international transport organisation with which you are in direct contact?

	Large general freight forwarder	Small general freight forwarder	Large specialist air forwarder	Small specialist air forwarder	Airline	Other
AIR service ranked FIRST						
AIR service ranked LAST						

Please specify "other".....

9. What are your terms of sale?

	Ex works	FOB UK airport or depot	CIF European airport or depot	Free delivered customer's premises	Other
AIR service ranked FIRST					
AIR service ranked LAST					

10. Approximately how many shipments (consignments) did you have in 1978?

AIR service ranked FIRST .....shipments

AIR service ranked LAST .....shipments

11. What was the size of your individual consignments by each of the services? Please answer this question to the degree of accuracy most convenient for you.

	Lightest consignment weight (kg)	Heaviest consignment weight (kg)	Approximate most likely consignment weight (kg)
AIR service ranked FIRST			
AIR service ranked LAST			

12. To which of the following countries did you send LESS THAN FULL LOAD shipments during 1978?

	Austria	Belgium	France	Italy	Netherlands	Spain	Switzerland	West Germany
Groupage by road								
Part load by road								
Groupage by rail								
Express van								
Other								

Please specify "other" .....

13. If you have not had LESS THAN FULL LOAD shipments during 1978 to at least two of the countries shown in question 12, please go to question 22.

Assume you had to rank all your LESS THAN FULL LOAD entries in question 12 in order of overall quality, having weighed up all the relevant factors.

Which would you put in FIRST place (as the most preferred)? Please tick only ONE box.

	Austria	Belgium	France	Italy	Nether-lands	Spain	Switz-erland	West Germany
Groupage by road								
Part load by road								
Groupage by rail								
Express van								
Other								

14. Which would you put in LAST place (as the least preferred)? Please tick only ONE box.

	Austria	Belgium	France	Italy	Nether-lands	Spain	Switz-erland	West Germany
Groupage by road								
Part load by road								
Groupage by rail								
Express van								
Other								

15. Please award each service a score for overall quality, where 9 = extremely good, 5 = neither good nor bad, and 1 = extremely bad.
(Please circle the appropriate score)

LESS THAN FULL LOAD service ranked FIRST	extremely good	9	8	7	6	5	4	3	2	1	extremely bad
LESS THAN FULL LOAD service ranked LAST	extremely good	9	8	7	6	5	4	3	2	1	extremely bad

16. What is/are your main reason(s) for ranking the LESS THAN FULL LOAD service in question 13 in FIRST place?

.....

17. What is/are your main reason(s) for ranking the LESS THAN FULL LOAD service in question 14 in LAST place?

.....

18. Which of the following types of organisation best describes the international transport organisation with which you are in direct contact?

	Large general freight forwarder	Small general freight forwarder	Large road haulier	Small road haulier	Ship-ping line	Rail-way company	Other
LESS THAN FULL LOAD service ranked FIRST							
LESS THAN FULL LOAD service ranked LAST							

19. What are your terms of sale?

	Ex works	FOB UK depot or port	CIF European depot or port	Free delivered customer's premises	Other
LESS THAN FULL LOAD service ranked FIRST					
LESS THAN FULL LOAD service ranked LAST					

20. Approximately how many shipments (consignments) did you have in 1978?

LESS THAN FULL LOAD service ranked FIRST .....shipments

LESS THAN FULL LOAD service ranked LAST .....shipments

21. What was the size of your individual consignments by each of the services? Please answer this question to the degree of accuracy most convenient for you.

	Lightest consignment weight (kg)	Heaviest consignment weight (kg)	Approximate most likely consignment weight (kg)
LESS THAN FULL LOAD service ranked FIRST			
LESS THAN FULL LOAD service ranked LAST			

22. What are your principal products sent to the markets described in this survey?

.....

23. Very approximately, what would be the ex works value of 1000 kg (one tonne) of your principal products?

£.....

24. What is the approximate cubic measurement of 1000kg (one tonne) of your principal products?

1000 kg = ... cubic metres/cubic feet (please delete as appropriate)

25. What is your job title?

.....

Thank you for your help. If you would be prepared to answer some further questions at a later date, and also learn the results of this and some associated work, please complete the following:

Your name .....
(Please print)

Your company's name.....

Your company's address .....

.....

Your company's telephone number.....Ext.....

CRANFIELD INSTITUTE OF TECHNOLOGY

PLEASE READ THE NOTES ON THE YELLOW PAGE BEFORE ANSWERING THESE QUESTIONS

1. Do you send goods to more than one place in the destination country by the type of transport shown below?

Please tick appropriate boxes

	Yes	No

2. Please write the name of the town of final destination for your consignments by the types of transport shown below. If your answer to any part of question 1 was YES, please enter the single most frequent destination. DO NOT ENTER MORE THAN ONE TOWN ON EACH LINE.

	Name of final destination town

IMPORTANT: WHEN ANSWERING QUESTIONS 3 TO 21 PLEASE RESTRICT YOUR ANSWERS TO THE SERVICES COVERING THE DESTINATIONS ENTERED IN QUESTION 2.

3. What type of company is your customer? (Please tick appropriate boxes)

	Retailer	Wholesaler or distributor	Manufacturer	Division of your company	Other (please specify)

4. In the earlier questionnaire you gave a very approximate ex works value of £ for 1000kg of your principal products. Does this value still apply for each of the destinations entered in question 2? (Please tick appropriate boxes)

	Yes	No	If NO, please give alternative approximate value for 1000kg

5. For each of the services, where does the journey start in Britain (the town where your factory or warehouse is situated)?

	Name of town

Please turn over

6. For each of the services, where is the operator or forwarder's depot or airport in Britain (if London - please indicate approximate area eg North, South-East etc)

	Name of town

7. For each of the services, where is the clearance depot or airport in the destination country?

	Name of town

8. From your experience, what is the most likely total transit time door-to-door between the start of the journey (question 5) and the final destination (question 2)?

Please give your answer in DAYS. You may prefer to enter either a single figure (eg 7 days) or a range of days (eg 2-4 days)

	Total transit time (in days)

9. How many operators/forwarders have you used in the past 12 months? This refers only to those with whom you have been in direct contact.

	No. of operators/forwarders

10. How long have you been using the forwarder/operator who has most of your business on each of the services shown below? (Please tick as appropriate)

	0-6 months	7-12 months	1 or 2 years	3 or 4 years	5 or 6 years	7 - 9 years	10 years or more

11. On how many of the four services are you using each of the forwarders or operators described in question 10? Please tick YES or NO boxes as appropriate.

The same one is used for all four services	YES / NO

A different one is used for each of the four services	YES / NO

The same one is used for both air services	YES / NO

The same one is used for both surface services	YE / NO

12. What is the size of your individual consignments by each of the services? Please answer this question to the degree of accuracy most convenient for you (eg nearest 100kg)

	Lightest consignment weight (kg)	Heaviest consignment weight (kg)	Approximate most likely consignment weight(kg)

13. What is the current international freight rate for your most likely consignment weight entered in question 12. If it is not known to you, please enter 'not known' against the appropriate service(s).

	Freight rate (please state currency)	Rate basis (eg per kg, per 100kg, minimum etc)

14. Do the above rates include the following charges? If YES, please tick appropriate box.

	Handling and documentation in UK	Cartage to UK depot or airport	Continental customs clearance and/ or handling	Final delivery on the continent

15. From what date were the freight rates valid?

	Beginning 1978	mid 1978	Beginning 1979	Other (please specify)

Please turn over

16. For your principal product(s) sent by each service, please would you give the most likely time from your firm's receipt of the customer's order to despatch from your warehouse.

Please give your answer in WEEKS for each service. You may prefer to enter either a single figure (eg 3 weeks) or a range of weeks (eg 3-7 weeks).

	Most likely time from receipt of customer's order to despatch from warehouse (in weeks)

17. Approximately what percentage of your consignments are regular, repeat orders of much the same size and product mix? (Please tick appropriate box)

	less than 25%	26-50%	51-75%	76-100%

18. What is the frequency of departure of the international vehicle (aircraft, trailer etc) from the British operator's depot or airport?(Please tick appropriate box)

	At least daily	4 times a week	3 times a week	Twice a week	Once a week	Less than once a week	It varies a lot

19. Does your operator or forwarder collect from your premises? (Please tick appropriate box)

	At least daily	4 times a week	3 times a week	Twice a week	Once a week	Occasionally as requested	Never

20. If it were decided to change the type of transport (eg from air to surface or vice-versa) what would be your personal involvement in the decision? (Please tick appropriate box)

	You would make the decision alone	It would be a joint decision between you and others in your company	It would be a joint decision between you and the customer	You would not be involved

21. If it were decided to change the transport operator or forwarder what would be your personal involvement in the decision? (Please tick appropriate box)

	You would make the decision alone	It would be a joint decision between you and others in your company	It would be a joint decision between you and the customer	You would not be involved

QUESTIONS 22 AND 23 REFER TO YOUR COMPANY'S EXPORTS WORLDWIDE. IF YOU WORK FOR A GROUP OF COMPANIES, PLEASE ANSWER ONLY FOR THE PART OF THE COMPANY FOR WHICH YOU WORK.

22. What is your company's approximate total annual export turnover?

Please tick one box

less than £½ million	£½M-£1M	£1M-£2M	£2M-£5M	£5M-£10M	£10M-£15M	£15M-£20M	£20M-£30M	£30M or more

23. Approximately how many export consignments (shipments) did your company send worldwide in 1978?

Please tick one box

Up to 99	100-499	500-999	1000-2499	2500-4999	5000-9999	More than 10000

QUESTIONS 24 TO 29 ARE INTENDED TO PROVIDE A PROFILE OF THE PEOPLE COMPLETING THE QUESTIONNAIRE

24. What is the name of your department? .....

25. Whom do you report to (job title)? .....

26. What director is responsible for your department (job title)?

.....

27. Very approximately, what proportion of your time is devoted to export shipping?

Please tick one box

0%	Up to 25%	26-50%	51-75%	76-100%

28. If export shipping is not your major activity, please state what is and approximately what proportion of your time you devote to it

Activity..... TIME = ... %

PLEASE TURN OVER

29. In what ways are you involved with the following activities in your company. (Please tick only one column for each a-k)

	I usually make important decisions	I do not make important decisions but I am usually consulted	I am usually not involved
a. Export shipping			
b. Import shipping			
c. Domestic transport			
d. Warehousing			
e. Stock (inventory) management			
f. Packing			
g. Order processing			
h. Export invoicing			
i. Export selling			
j. Export sales forecasting			
k. Customer enquiries			

THANK YOU FOR YOUR TIME. PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE FREEPOST ENVELOPE

CRANFIELD INSTITUTE OF TECHNOLOGY

PLEASE READ THE NOTES ON THE YELLOW PAGE BEFORE ANSWERING THESE QUESTIONS

1. Do you send goods to more than one place in the destination country by the type of transport shown below?

Please tick appropriate boxes

	Yes	No
AIR TO FRANCE		
AIR TO ITALY		
ROAD GROUPAGE TO FRANCE		
ROAD GROUPAGE TO ITALY		

2. Please write the name of the town of final destination for your consignments by the types of transport shown below. If your answer to any part of question 1 was YES, please enter the single most frequent destination. DO NOT ENTER MORE THAN ONE TOWN ON EACH LINE.

	Name of final destination town
AIR TO FRANCE	
AIR TO ITALY	
ROAD GROUPAGE TO FRANCE	
ROAD GROUPAGE TO ITALY	

IMPORTANT: WHEN ANSWERING QUESTIONS 3 TO 21 PLEASE RESTRICT YOUR ANSWERS TO THE SERVICES COVERING THE DESTINATIONS ENTERED IN QUESTION 2.

3. What type of company is your customer? (Please tick appropriate boxes)

	Retailer	Wholesaler or distributor	Manufacturer	Division of your company	Other (please specify)
AIR TO FRANCE					
AIR TO ITALY					
ROAD GROUPAGE TO FRANCE					
ROAD GROUPAGE TO ITALY					

4. In the earlier questionnaire you gave a very approximate ex works value of £ 1400 for 1000kg of your principal products. Does this value still apply for each of the destinations entered in question 2? (Please tick appropriate boxes)

	Yes	No	If NO, please give alternative approximate value for 1000kg
AIR TO FRANCE			
AIR TO ITALY			
ROAD GROUPAGE TO FRANCE			
ROAD GROUPAGE TO ITALY			

5. For each of the services, where does the journey start in Britain (the town where your factory or warehouse is situated)?

	Name of town
AIR TO FRANCE	
AIR TO ITALY	
ROAD GROUPAGE TO FRANCE	
ROAD GROUPAGE TO ITALY	

Please turn over

6. For each of the services, where is the operator or forwarder's depot or airport in Britain (if London - please indicate approximate area eg North, South-East etc)

	Name of town
AIR TO FRANCE	
AIR TO ITALY	
ROAD GROUPAGE TO FRANCE	
ROAD GROUPAGE TO ITALY	

7. For each of the services, where is the clearance depot or airport in the destination country?

	Name of town
AIR TO FRANCE	
AIR TO ITALY	
ROAD GROUPAGE TO FRANCE	
ROAD GROUPAGE TO ITALY	

8. From your experience, what is the most likely total transit time door-to-door between the start of the journey (question 5) and the final destination (question 2)?

Please give your answer in DAYS. You may prefer to enter either a single figure (eg 7 days) or a range of days (eg 2-4 days)

	Total transit time (in days)
AIR TO FRANCE	
AIR TO ITALY	
ROAD GROUPAGE TO FRANCE	
ROAD GROUPAGE TO ITALY	

9. How many operators/forwarders have you used in the past 12 months? This refers only to those with whom you have been in direct contact.

	No. of operators/forwarders
AIR TO FRANCE	
AIR TO ITALY	
ROAD GROUPAGE TO FRANCE	
ROAD GROUPAGE TO ITALY	

10. How long have you been using the forwarder/operator who has most of your business on each of the services shown below? (Please tick as appropriate)

	0-6 months	7-12 months	1 or 2 years	3 or 4 years	5 or 6 years	7 - 9 years	10 years or more
AIR TO FRANCE							
AIR TO ITALY							
ROAD GROUPAGE TO FRANCE							
ROAD GROUPAGE TO ITALY							

11. On how many of the four services are you using each of the forwarders or operators described in question 10? Please tick YES or NO boxes as appropriate.

The same one is used for all four services	YES		A different one is used for each of the four services	YES		The same one is used for both air services	YES		The same one is used for both surface services	Y
	NO			NO			NO			N

12. What is the size of your individual consignments by each of the services? Please answer this question to the degree of accuracy most convenient for you (eg nearest 100kg)

	Lightest consignment weight (kg)	Heaviest consignment weight (kg)	Approximate most likely consignment weight (kg)
AIR TO FRANCE			
AIR TO ITALY			
ROAD GROUPAGE TO FRANCE			
ROAD GROUPAGE TO ITALY			

13. What is the current international freight rate for your most likely consignment weight entered in question 12. If it is not known to you, please enter 'not known' against the appropriate service(s).

	Freight rate (please state currency)	Rate basis (eg per kg, per 100kg, minimum etc)
AIR TO FRANCE		
AIR TO ITALY		
ROAD GROUPAGE TO FRANCE		
ROAD GROUPAGE TO ITALY		

14. Do the above rates include the following charges? If YES, please tick appropriate box.

	Handling and documentation in UK	Cartage to UK depot or airport	Continental customs clearance and/ or handling	Final delivery on the continent
AIR TO FRANCE				
AIR TO ITALY				
ROAD GROUPAGE TO FRANCE				
ROAD GROUPAGE TO ITALY				

15. From what date were the freight rates valid?

	Beginning 1978	mid 1978	Beginning 1979	Other (please specify)
AIR TO FRANCE				
AIR TO ITALY				
ROAD GROUPAGE TO FRANCE				
ROAD GROUPAGE TO ITALY				

Please turn over

16. For your principal product(s) sent by each service, please would you give the most likely time from your firm's receipt of the customer's order to despatch from your warehouse.

Please give your answer in WEEKS for each service. You may prefer to enter either a single figure (eg 3 weeks) or a range of weeks (eg 3-7 weeks).

	Most likely time from receipt of customer's order to despatch from warehouse (in weeks)
AIR TO FRANCE	
AIR TO ITALY	
ROAD GROUPAGE TO FRANCE	
ROAD GROUPAGE TO ITALY	

17. Approximately what percentage of your consignments are regular, repeat orders of much the same size and product mix? (Please tick appropriate box)

	less than 25%	26-50%	51-75%	76-100%
AIR TO FRANCE				
AIR TO ITALY				
ROAD GROUPAGE TO FRANCE				
ROAD GROUPAGE TO ITALY				

18. What is the frequency of departure of the international vehicle (aircraft, trailer etc) from the British operator's depot or airport?(Please tick appropriate box)

	At least daily	4 times a week	3 times a week	Twice a week	Once a week	Less than once a week	It varies a lot
AIR TO FRANCE							
AIR TO ITALY							
ROAD GROUPAGE TO FRANCE							
ROAD GROUPAGE TO ITALY							

19. Does your operator or forwarder collect from your premises? (Please tick appropriate box)

	At least daily	4 times a week	3 times a week	Twice a week	Once a week	Occasionally as requested	Never
AIR TO FRANCE							
AIR TO ITALY							
ROAD GROUPAGE TO FRANCE							
ROAD GROUPAGE TO ITALY							

20. If it were decided to change the type of transport (eg from air to surface or vice-versa) what would be your personal involvement in the decision? (Please tick appropriate box)

	You would make the decision alone	It would be a joint decision between you and others in your company	It would be a joint decision between you and the customer	You would not be involved
AIR TO FRANCE				
AIR TO ITALY				
ROAD GROUPAGE TO FRANCE				
ROAD GROUPAGE TO ITALY				

21. If it were decided to change the transport operator or forwarder what would be your personal involvement in the decision? (Please tick appropriate box)

	You would make the decision alone	It would be a joint decision between you and others in your company	It would be a joint decision between you and the customer	You would not be involved
AIR TO FRANCE				
AIR TO ITALY				
ROAD GROUAGE TO FRANCE				
ROAD GROUPAGE TO ITALY				

QUESTIONS 22 AND 23 REFER TO YOUR COMPANY'S EXPORTS WORLDWIDE. IF YOU WORK FOR A GROUP OF COMPANIES, PLEASE ANSWER ONLY FOR THE PART OF THE COMPANY FOR WHICH YOU WORK.

22. What is your company's approximate total annual export turnover?

less than £½ million	£½M-£1M	£1M-£2M	£2M-£5M	£5M-£10M	£10M-£15M	£15M-£20M	£20M-£30M	£30M or more

Please tick one box

23. Approximately how many export consignments (shipments) did your company send worldwide in 1978?

Up to 99	100-499	500-999	1000-2499	2500-4999	5000-9999	More than 10000

Please tick one box

QUESTIONS 24 TO 29 ARE INTENDED TO PROVIDE A PROFILE OF THE PEOPLE COMPLETING THE QUESTIONNAIRE

24. What is the name of your department? .....

25. Whom do you report to (job title)? .....

26. What director is responsible for your department (job title)?

.....

27. Very approximately, what proportion of your time is devoted to export shipping?

0%	Up to 25%	26-50%	51-75%	76-100%

Please tick one box

28. If export shipping is not your major activity, please state what is and approximately what proportion of your time you devote to it

Activity..... TIME = ... %

PLEASE TURN OVER

29. In what ways are you involved with the following activities in your company. (Please tick only one column for each a-k)

	I usually make important decisions	I do not make important decisions but I am usually consulted	I am usually not involved
a. Export shipping			
b. Import shipping			
c. Domestic transport			
d. Warehousing			
e. Stock (inventory) management			
f. Packing			
g. Order processing			
h. Export invoicing			
i. Export selling			
j. Export sales forecasting			
k. Customer enquiries			

THANK YOU FOR YOUR TIME. PLEASE RETURN THE COMPLETED QUESTIONNAIRE IN THE FREEPOST ENVELOPE

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

Three modal contrasts are possible:

Most preferred air route-service contrasted with least preferred air route-service = A v A

Most preferred surface route-service contrasted with least preferred surface route-service = S v S

Route-service by air contrasted with same route-service by surface = A v S

RESP-OND-ENT REF.	MODAL CONTRAST	CONSTRUCT
Subject matter: Transport contacts		
A	A v A S v S	The range of quality of different agents is very wide/very narrow
A	S v S	The service that larger agents provide compared with smaller agents is very much better/very much worse
C	S v S	Finding a British transport operator or forwarding agent with his own agent in the destination country is very easy/very difficult
C	A v S	The clearance agent in the destination country is very good/very bad
E	S v S	Your relationship with the forwarder or operator is very good/very bad
E	S v S	The range of quality of transport operators or forwarders is very wide/very narrow
E	S v S	For this service you prefer the size of your forwarder's or operator's company to be very big/very small
F	S v S	The influence on the quality of service resulting from the volume of business you give the operator or forwarder is very great/very small
G	S v S	The range of carriers to choose from is very narrow/very wide
I	S v S	If there is a panic shipment, the influence of your forwarding agent would have on the continental clearance agent is very large/very small
I	S v S	The influence of the amount of your business, which you give the forwarder or operator, on his quality of service is very large/very small
I	S v S	Competition between forwarders is very heavy/very light
I	S v S	Finding a forwarder or operator who specialises to this (ie overseas) country is very important/very unimportant
I	A v A	Cooperation from your forwarder or operator is very good/very bad
K	A v A	The calibre of the employees in the transport or forwarder firm with which you deal directly is very good/very poor
K	A v S	The influence of sales representatives (from forwarders or operators) in your selecting this service was very great/very small

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESPONDENT REF.	MODAL CONTRAST	CONSTRUCT
Subject matter: Transport contacts(cont).		
L	S v S	The influence on the quality of the service resulting from the volume of business you give the forwarder is likely to be very great/very small
M	S v S	Compared with other forwarders or operators on this service, the one you use is very good/very bad
M	S v S	Considered as a general forwarder for a large number of destinations, the forwarder you use on this particular service is very good/very bad
N	S v S	The range of quality of service offered by different forwarders or operators is very wide/very narrow
O	S v S	The range of quality of service offered by different forwarders or operators is very wide/very narrow
Subject matter: Cost versus time		
A	A v S	When compared with transit time, cost of transport is very important/very unimportant
B	A v A A v S	For the cost the speed of service is very good/very bad
C	A v S	For the cost the door-to-door transit time is very good/very bad
E	A v A	For the price paid the total transit time is very good/very bad
N	A v A	When compared with the transit time, the cost of the service is very high/very low
Subject matter: Product		
A	A v S	Capital equipment, involving your engineers being on site, is sent by this service always/never
F	A v S	Taking into account your product's weight, volume and value this service is very suitable, very unsuitable
I	A v A	This service is used for samples always/never
M	A v S	For the value of the goods sent on this service, the cost of freight is very expensive/very inexpensive
N	A v S	In your opinion, given the consignment sizes being sent, this type of transport is very suitable/very unsuitable
O	A v S	In normal circumstances, for your product weight this transport service is very suitable/very unsuitable
Q	A v S	For the weight and volume of the consignments, this type of transport is very suitable/very unsuitable

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESPONDENT REF.	MODAL CONTRAST	CONSTRUCT
Subject matter: Shipper(other than product)		
A	A v S	In terms of delivery date given to your customer, consignments sent by this service are late leaving your premises always/never
A	A v S	Arranging despatch of goods from your premises by this service is very easy/very difficult
G	S v S	The workload for you or your department in arranging the transport is very much more than average/very much less than average
H	A v A	The work involved for your department when sending a single consignment by this service is very much/hardly any
I	A v A	Your experience of this service is very large/very limited
J	A v A	Would you say that your level of knowledge about the transport service shown is very high/very low
Subject matter: Urgency		
B	A v A A v S	This service is used in an emergency always/never
D	A v A A v S	This service is used for urgent consignments always/never
E	A v S	This service is used when goods are late or required urgently always/never
E	A v S	For urgent consignments (eg spare parts for broken machinery) this service is used always/never
G	A v S	This service is used for urgent consignments always/never
H	A v S	This service is used in an emergency always/never
I	A v S	This service is used for urgent shipments always/never
J	A v S	For urgent consignments this service would be used always/never
K	A v S	This service is used when spares are required for a production line breakdown
L	A v S	For urgent consignments, this service would be used always/never
M	A v A	For urgent consignments this service is used always/never
O	A v S	This service is used for urgent consignments always/never
P	A v S	This service is used when consignments have to make up for lost time owing to production delays always/never
Q	A v S	For urgent consignments this service is used always/never

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESP-OND-ENT REF.	MODAL CONTRAST	CONSTRUCT
Subject matter: Frequency of departure		
B	A v A	The frequency of departure from the UK is very good/very bad
D	A v A	It is possible to book space on a particular departure always/never
D	S v S	Departures from the UK are very regular/very irregular
E	S v S	Availability of services (ie road vehicles, aircraft) on this route is very good/very bad
F	A v A	The frequency of departure is very good/very bad
H	S v S	Collection of goods from your premises by the transport operator or forwarder is very good/very bad
I	S v S	Departures from the UK are very regular/very irregular
K	S v S	For the price, the frequency of service is very good/very bad
K	A v A	Departures from the UK are very regular/very irregular
L	A v A	The frequency of service is likely to be very good/very bad
Subject matter: Cost (other than related to time)		
B	A v A	FOB charges on this service are very high/very low
F	A v A	For the quality of service the freight rate is very reasonable/very unreasonable
G	S v S	The range of freight rates charged by different carriers for a similar service is very narrow/very wide
G	A v S	For the type of transport and the distance, the cost of freight is very high/very low
H	A v A	For the type of service the best available rates are very high/very low
H	A v S	Taking only costs into consideration this service is very expensive/very inexpensive
I	S v S	Taking only costs into consideration this service is very expensive/very inexpensive
I	A v A	FOB charges for this service are very high/very low
J	S v S	In terms of what you get, the price of the service is very inexpensive/very expensive
K	S v S	In terms of cost-effectiveness this service is very good/very bad
K	A v S	Allowing for distance,compared with other services in this question, the freight rate is very high/very low

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESP-OND-ENT REF.	MODAL CONTRAST	CONSTRUCT
L	S v S	Compared with the general quality of service, the cost is likely to be very important/very unimportant
M	S v S	For the quality of service the cost of freight is ver y expensive/very inexpensive
Subject matter: Monitoring and control		
B	A v A	The feedback on arrival times in the destination country is very good/very bad
D	A v A	The feedback from the transport operator or agent in the destination country is very good/very bad
D	A v A	Confirmation of the departure date is received from the operator or forwarder always/never
D	A v A	Tracing consignments is very easy/very difficult
D	S v S	Obtaining proof of delivery is very easy/very difficult
H	A v A	You are likely to be informed of problems in the destination country by the transport operator or forwarder always/never
K	S v S	Monitoring this service is very easy/very difficult
L	S v S	The control which you are likely to keep over your goods during transit is very good/very bad
M	A v A	The control which you are able to keep over your goods during transit is very good/very bad
N	A v A	Tracing the arrival of the goods at destination is very easy/ very difficult
P	S v S	The control which you are able to keep over your goods during transit is very good/very bad
Q	S v S	Obtaining proof of despatch (eg cert of shipment) is very easy/very difficult
Subject matter: Clearance		
B	A v A	Clearance in the destination country is very good/very bad
C	A v A	Customs clearance problems in the destination country happen always/never
D	A v A	Cooperation between the transport operator and the customs in the destination country is very good/very bad
F	A v A	Customs clearance in the destination country is very good/ very bad
G	A v A	Clearance facilities in the destination country for this service are very good/very bad

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESPONDENT REF.	MODAL CONTRAST	CONSTRUCT
Subject matter: Clearance (cont)		
H	S v S	There are problems with the customs at the destination always/never
J	A v A	Difficulties with customs in the destination country happen always/never
L	A v A	Customs clearance in the destination country is very good/very bad
Q	A v A	Clearance in the destination country is very fast/very slow
Subject matter: Security, damage, loss		
B	S v S	Security on this service is very good/very bad
F	A v A	Damage to your goods using this service happens always/never
P	S v S	Your goods have tended to go astray on this service always/never
Q	S v S	Your goods have tended to get lost on this service always/never
Subject matter: Transport equipment		
B	S v S	The quality of equipment (eg trailers) used on this service is very good/very bad
Subject matter: Distance versus time		
C	A v A	For the type of transport and the distance the door-to-door transit time is very good/very bad
D	S v S A v S	For the type of transport and the distance, the door-to-door transit time is very good/very bad
G	A v S	For the type of transport and the distance, the door-to-door transit time is very good/very bad
N	A v A	For the type of transport and the distance, the transit time is very good/very bad
O	S v S	For the type of transport and the distance, the door-to-door transit time is very good/very bad
P	A v S	For the distance the door-to-door transit time is very good/very bad
Q	S v S	For the distance, the transit time is very good/very bad

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESPONDENT REF.	MODAL CONTRAST	CONSTRUCT
Subject matter: Final delivery		
C	S v S	Final delivery to the customer is very efficient/very inefficient
E	A v S	The final delivery from the continental depot or airport to the final destination is very fast/very slow
G	A v A	Arranging transport to final destinations away from the main centres is very easy/very difficult
H	A v A	Problems in the destination country during transport occur always/never
J	S v S	In terms of distance from the main international transport routes, the final destinations are very remote/very near
J	S v S	Costs of reforwarding in the destination country are very high/very low
L	A v A	The quality of on-carriage in the destinationcountry is very good/very bad
O	S v S	Final delivery in the destination country to the customer is very efficient/very inefficient
Q	S v S	Delivery to the customer is very reliable/very unreliable
Subject matter: Time(other than related to distance or cost)		
E	S v S	This service is very fast/very slow
H	A v A	For the type of service the total transit time is very fast/very slow
I	A v A	For the type of transport the transit time is very good/ very bad
J	S v S	This service is generally very fast/very slow
L	S v S	The door-to-door transit time is very good/very bad
M	S v S	For the type of service (ie road or air) the door-to-door transit time is very good/very bad
Subject matter: Documentation		
D	S v S	Invoicing (billing) by transport operators is very efficient/ very inefficient
D	S v S	The agent or transport operator is prepared to despatch your goods without documentation from you always/never
E	A v A	Documentation requirements from the destination country are very difficult/very easy

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESPONDENT REF.	MODAL CONTRAST	CONSTRUCT
Subject matter: Documentation (cont)		
F	A v A	Transport documentation problems happen always/never
F	S v S	The delivery of documents to the agent in the destination country is very efficient/very inefficient
G	S v S	Arranging documentation is very easy/very difficult
H	S v S	Queries about transport documentation occur always/never
K	A v A	Handling of documentation by the forwarder or operator is very efficient/very inefficient
M	S v S	Problems about documentation occur always/never
O	S v S	The transmittal of documents to the customer by the agent or operator is very efficient/very inefficient
Q	S v S	Queries about documentation are made by forwarding agents always/never
Subject matter: Consignee's influence		
E	A v S	The operator or agent you use on this route is requested by the customer always/never
F	A v A	The operator or agent you use on this route is requested by the customer always/never
K	S v S	The customer's influence on using this service was very great/very slight
L	S v S	The operator or agent you use on this service is likely to be requested by the customer always/never
N	S v S	You use the services proposed by customers in routing orders always/never
O	A v S	You use the services proposed by customers in routing orders always/never
P	A v S	The operator or agent you use on this route is requested by the customer always/never
Q	A v S	The operator or agent you use on this route is requested by the customer always/never
Subject matter: Flexibility		
G	A v S	In terms of adapting to unforeseen circumstances (eg strikes, bad weather) the service is very flexible/very inflexible
Subject matter: Depot delays		
A	A v A	Handling at the destination airport or depot is very good/very bad

ANALYSIS OF CONSTRUCTS BY SUBJECT MATTER AND MODAL CONTRAST

RESPONDENT REF.	MODAL CONTRAST	CONSTRUCT
B	S v S	Delays waiting for available transport equipment in the UK occur always/never
C	A v A	Delays at destination depots or airports happen always/never
D	A v A	Goods are despatched on the anticipated service (flight, trailer) always/never
D	A v A	Delays at the destination depot or airport occur always/never
G	A v A	Delays at depots or airports happen always/never
G	A v S	Delays before departure from the UK occur always/never
H	A v S	Your goods depart on time always/never
E	S v S	Delays through transhipment or handling happen always/never
L	S v S	The place to which you deliver in the UK (eg forwarders' depot) is, for your company, very accessible/very inaccessible
L	S v S	Delays are likely to occur in the UK at the forwarder's depot always/never
M	S v S	Delays at destination depots or airports occur always/never
M	S v S	Goods are despatched on the anticipated service always/never
O	A v A	Goods are despatched on the anticipated day always/never
P	A v A	Goods are despatched on the anticipated service (flight, trailer etc) always/never
Q	S v S	Delivery to the operator's depot in the UK is very easy/very difficult
Q	A v A	Delays caused by transhipment occur always/never

APPENDIX E
(Sheet 1 of 17)

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

(for actual format of an example grid see figure 7.2 in chapter 7 - all questions offer option of 0 = no opinion which is not repeated here)

RESPONDENT A

Route-services

(a)air to France (b)part load (road) to France (c)Air to Italy (d)part load (road) to Italy (e)air to Holland (f)part load (road) to Holland (g)air to W. Germany (h)part load (road) to W. Germany

Constructs

A. Handling at the destination airport or depot is generally (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. The range of quality of service of different agents is (1)very wide (2)quite wide (3)neutral (4)quite narrow (5)very narrow

C. The service that larger agents provide compared with smaller agents is (1)very much better (2)quite better (3)neutral (4)quite worse (5)very much worse

D. When compared with transit time, cost of transport is (1)very important (2)quite important (3)neutral (4)quite unimportant (5)very unimportant

E. Capital equipment, involving your engineers being on site,is sent by this service (1)always (2)often (3)neutral (4)seldom (5)never

F. Arranging despatch of goods from your premises by this service is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

G. In terms of delivery date given to your customer, consignments sent by this service are late leaving your premises (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	2	3	2	3	2	2	2	2
B	5	3	5	2	5	2	5	2
C	3	3	3	4	3	4	3	4
D	4	4	4	4	4	4	4	4
E	2	4	2	4	2	3	2	3
F	1	1	1	1	1	1	1	1
G	3	3	2	3	3	3	3	3

RESPONDENT B

Route-services

(a)scheduled air to Austria (b)consolidated air to Holland (c)scheduled air to Spain (d)scheduled air to Switzerland (e)part load road to Austria (f)part load road to Holland (g)part load road to Spain (h)part load road to Switzerland

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT B (cont)

Constructs

A. This service is used in an emergency (1)always (2)often (3)neutral (4)seldom (5)never

B. For the cost, the speed of service is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

C. The frequency of departure from the UK is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

D. F.o.b. charges for this service are (1)very high (2)quite high (3)neutral (4)quite low (5)very low

E. The feedback on arrival times in the destination country is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

F. Clearance in the destination country is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

G. Security of your goods on this service is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

H. The quality of equipment (eg trailers, vans) used on this service is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

I. Delays waiting for available transport equipment in the UK occur (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	4	4	4	4	3	5	3	3
B	3	3	3	3	2	0	2	1
C	2	2	2	2	2	0	3	2
D	2	2	2	2	3	0	3	3
E	4	4	4	4	4	0	4	3
F	2	2	3	2	3	0	3	2
G	1	1	3	1	3	0	3	1
H	1	1	3	1	2	0	2	1
I	3	3	3	3	2	0	2	3

RESPONDENT C

Route-services

(a)air to Austria (b)road groupage to Austria (c)air to Belgium (d)express van to France (e)air to Holland (f)road groupage to Holland (g)air to Spain (h)road groupage to Spain

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT C (cont)

Constructs

A. For the type of transport and the distance, the door-to-door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. Delays at destination depots or airports occur (1)always (2)often (3)neutral (4)seldom (5)never

C. Customs clearance problems occur in the destination country (1)always (2)often (3)neutral (4)seldom (5)never

D. Final delivery to the customer is (1)very efficient (2)quite efficient (3)neutral (4)quite inefficient (5)very inefficient

E. Finding a British transport operator or forwarder with his own agent in the destination country is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

F. For the cost the door-to-door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

G. The clearance agent in the destination country is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	4	3	1	2	1	2	1	5
B	3	2	5	4	4	4	4	2
C	3	3	5	4	4	4	4	3
D	3	2	1	2	1	1	2	4
E	2	1	1	1	1	1	2	3
F	3	3	1	2	1	1	2	3
G	3	3	1	2	1	1	2	3

RESPONDENT D

Route-services

(a)air to France (b)air to Spain (c)air to Switzerland (d)air to W. Germany (e)road groupage to France (f)road groupage to Spain (g)rail groupage to Switzerland (h)rail groupage to W. Germany

Constructs

A. This service is used for urgent consignments (1)always (2)often (3)neutral (4)seldom (5)never

B. The feedback from the transport operator or agent in the destination country is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

C. Goods are despatched on the anticipated service (flight, trailer) etc (1)always (2)often (3)neutral (4)seldom (5)never

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT D (cont)

Constructs (cont)

D. Cooperation between the transport operator and the customs in the destination country is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

E. Delays at the destination depot or airport occur (1)always (2)often (3)neutral (4)seldom (5)never

F. It is possible to book space on a particular departure (1)always (2)often (3)neutral (4)seldom (5)never

G. Confirmation of the departure date is received from the operator or forwarder (1)always (2)often (3)neutral (4)seldom (5)never

H. Tracing consignments is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

I. Departures from the UK are (1)very regular (2)quite regular (3)neutral (4)quite irregular (5)very irregular

J. Obtaining proof of delivery is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

K. For the type of transport and the distance, the door-to-door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

L. Invoicing (billing) by transport operators or forwarders is (1)very efficient (2)quite efficient (3)neutral (4)quite inefficient (5)very inefficient

M. The agent or transport operator is prepared to despatch your goods without documentation from you (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	1	2	2	2	4	5	5	5
B	2	4	3	4	1	3	5	5
C	2	3	2	2	3	3	4	3
D	2	5	3	3	2	3	3	3
E	4	2	3	4	4	2	2	2
F	2	3	3	2	2	3	0	4
G	1	3	2	1	3	3	3	3
H	2	4	3	2	1	5	4	5
I	2	3	4	4	1	3	4	4
J	1	3	2	2	1	4	4	4
K	2	3	3	3	2	4	5	5
L	1	1	1	1	2	2	2	5
M	4	4	4	4	2	4	5	5

RESPONDENT E

Route-services

(a)air to Austria (b)road groupage to Austria (c)air to Belgium (d)road groupage to Belgium (e)air to France (f)road groupage to France (g)air to W. Germany (h)road groupage to W. Germany

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT E (cont)

Constructs

A. This service is (1)very fast (2)quite fast (3)neutral (4)quite slow (5)very slow

B. Your relationship with the forwarder or operator is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

C. The range of quality of transport operators or forwarders is (1)very wide (2)quite wide (3)neutral (4)quite narrow (5)very narrow

D. For this service, you prefer the size of your forwarders' or operators' company to be (1)very big (2)quite big (3)neutral (4)quite small (5)very small

E. Availability of services (ie road vehicles, aircraft) on this route is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

F. Documentation requirements for the destination country are (1)very difficult (2)quite difficult (3)neutral (4)quite easy (5)very easy

G. Delays through transhipment or handling happen (1)always (2)often (3)neutral (4)seldom (5)never

H. For the price paid, the total transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

I. The operator or agent you use on this route is requested by the customer (1)always (2)often (3)neutral (4)seldom (5)never

J. The final delivery from the continental depot or airport to the final destination is (1)very fast (2)quite fast (3)neutral (4)quite slow (5)very slow

K. This service is used when goods are late or required urgently (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, clumns = route-services)

	a	b	c	d	e	f	g	h
A	3	3	1	2	2	1	1	1
B	2	3	1	2	1	1	1	1
C	2	2	1	1	2	1	1	1
D	2	2	1	2	1	4	1	2
E	2	3	1	1	1	1	1	1
F	3	3	5	5	5	5	5	5
G	3	3	4	5	5	5	5	5
H	3	3	2	2	2	1	2	1
I	2	2	2	1	4	1	1	1
J	3	3	2	2	1	1	1	1
K	2	4	2	2	2	2	2	2

RESPONDENT F

Route-services

(a)air to France (b)road groupage to Holland (c)air to Spain (d)road

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT F (cont)

Route-services (cont)
groupage to Italy (e)air to Italy (f)road groupage to France (g)air to Belgium (h)road groupage to Belgium

Constructs
A. The operator or agent you use on this route is requested by the customer (1)always (2)often (3)neutral (4)seldom (5)never

B. For the quality of service the freight rate is (1)very reasonable (2)quite reasonable (3)neutral (4)quite unreasonable (5)very unreasonable

C. The frequency of departure is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

D. Customs clearance in the destination country is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

E. Damage to your goods using this service happens (1)always (2)often (3)neutral (4)seldom (5)never

F. Transport documentation problems happen (1)always (2)often (3)neutral (4)seldom (5)never

G. The influence on the quality of service resulting from the volume of business you give the operator or forwarder is (1)very great (2)quite great (3)neutral (4)quite small (5)very small

H. The delivery of documents to the agent in the destination country is (1)very efficient (2)quite efficient (3)neutral (4)quite inefficient (5)very inefficient

I. For urgent consignments (eg spare parts for broken machinery) this service is used (1)always (2)often (3)neutral (4)seldom (5)never

J. Taking into account your products' weight, volume and value this service is (1)very suitable (2)quite suitable (3)neutral (4)quite unsuitable (5)very unsuitable

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	1	1	4	2	4	1	4	2
B	1	1	3	2	2	1	3	2
C	1	1	1	2	2	1	3	2
D	1	1	2	3	0	1	0	2
E	5	5	3	4	4	5	4	3
F	5	5	3	3	4	5	4	3
G	1	1	4	1	4	1	0	5
H	1	1	3	2	3	2	3	3
I	1	5	1	5	2	5	2	5
J	1	1	2	1	3	1	3	3

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT G

Route-services
(a)air to Belgium (b)air to France (c)air to Spain (d)air to W. Germany (e)road groupage to Belgium (f)road groupage to France (g)road groupage to Spain (h)road groupage to W.Germany

Constructs
A. Clearance facilities in the destination country for this service are (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. Arranging transport to final destinations away from the main centres is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

C. Delays at depots or airports happen (1)always (2)often (3)neutral (4)seldom (5)never

D. Arranging documentation is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

E. The range of carriers to choose from is (1)very narrow (2)quite narrow (3)neutral (4)quite wide (5)very wide

F. The range of freight rates charged by different carriers for a similar service is (1)very narrow (2)quite narrow (3)neutral (4)quite wide (5)very wide

G. The workload for you or your department in arranging the transport is (1)very much more than average (2)somewhat more than average (3)neutral (4)somewhat less than average (5)very much less than average

H. This service is used for urgent consignments (1)always (2)often (3)neutral (4)seldom (5)never

I. In terms of adapting to unforeseen circumstances (eg strikes, bad weather) the service is (1)very flexible (2)quite flexible (3)neutral (4)quite inflexible (5)very inflexible

J. For the type of transport and the distance, the door to door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

K. Delays before departure from the United Kingdom occur (1)always (2)often (3)neutral (4)seldom (5)never

L. For the type of transport and the distance, the cost of freight is (1)very high (2)quite high (3)neutral (4)quite low (5)very low

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	1	2	3	1	1	2	3	1
B	0	0	0	2	1	2	3	1
C	4	4	3	4	4	4	3	4
D	1	1	2	1	1	1	3	1
E	2	2	2	2	5	5	4	5
F	2	2	2	2	4	4	5	4
G	4	4	3	4	4	4	2	4
H	4	4	2	2	2	2	3	3
I	3	3	3	3	2	2	3	2
J	2	2	3	2	1	2	2	1
K	4	4	4	4	4	4	4	4
L	3	3	3	3	4	4	3	4

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT H

Route-services

(a)air to France (b)air to Italy (c)air to Spain (d)air to W.Germany (e)road groupage to France (f)road groupage to Italy (g)road groupage to Spain (h)road groupage to W. Germany

Constructs

A. For the type of service the best available rates are (1)very high (2)quite high (3)neutral (4)quite low (5)very low

B. For the type of service the total transit time is (1)very fast (2)quite fast (3)neutral (4)quite slow (5)very slow

C. Problems in the destination country during transport occur (1)always (2)often (3)neutral (4)seldom (5)never

D. You are likely to be informed of problems in the destination country by the transport operator or forwarder .(1)always (2)often (3)neutral (4)seldom (5)never

E. The work involved for your department when sending a single consignment by this service is (1)very much (2)quite a lot (3)neutral (4)quite little (5)hardly any

F. Collection of goods from your premises by the transport operator or forwarder is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

G. Queries about transport documentation occur (1)always (2)often (3)neutral (4)seldom (5)never

H. There are problems with customs at the destination (1)always (2)often (3)neutral (4)seldom (5)never

I. This service is used in an emergency (1)always (2)often (3)neutral (4)seldom (5)never

J. Your goods depart on time (1)always (2)often (3)neutral (4)seldom (5)never

K. Taking only costs into consideration, this service is (1)very expensive (2)quite expensive (3)neutral (4)quite inexpensive (5)very inexpensive

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	3	3	3	4	4	4	3	3
B	2	3	3	1	2	2	3	2
C	4	4	4	5	3	4	3	5
D	1	1	1	1	5	3	3	1
E	4	4	4	4	3	4	4	5
F	1	1	1	1	2	1	2	2
G	4	4	4	5	3	4	3	5
H	5	5	4	5	5	5	3	5
I	1	1	1	1	3	3	4	2
J	2	2	2	2	2	2	2	2
K	3	2	2	3	3	3	3	3

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT I

Route-services

(a)air to Austria (b)road groupage to Austria (c)air to France (d)road groupage to France (e)air to Holland (f)road groupage to Holland (g)air to Switzerland (h)road groupage to Switzerland

Constructs

A. Taking only costs into consideration, this service is (1)very expensive (2)quite expensive (3)neutral (4)quite inexpensive (5)very inexpensive

B. Departures from the UK are (1)very regular (2)quite regular (3)neutral (4)quite irregular (5)very irregular

C. If there is a panic shipment, the influence your forwarding agent would have on the continental clearance agent is (1)very large (2)quite large (3)neutral (4)quite small (5)very small

D. The influence of the amount of your business, which you give the forwarder or operator, on his quality of service is (1)very large (2)quite large (3)neutral (4)quite small (5)very small

E. Competition between forwarders is (1)very heavy (2)quite heavy (3)neutral (4)quite light (5)very light

F. Finding a forwarder or operator who specialises to this country is (1)very important (2)quite important (3)neutral (4)quite unimportant (5)very unimportant

G. Cooperation from your forwarder or operator is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

H. Your experience of this service is (1)very large (2)quite large (3)neutral (4)quite limited (5)very limited

I. This service is used for urgent shipments (1)always (2)often (3)neutral (4)seldom (5)never

J. This service is used for samples (1)always (2)often (3)neutral (4)seldom (5)never

K. For the type of transport, the transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

L. F.O.B charges for this service are (1)very high (2)quite high (3)neutral (4)quite low (5)very low

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	2	4	2	5	2	3	2	3
B	2	1	2	1	1	1	2	1
C	2	2	4	2	3	3	3	3
D	3	2	3	1	4	3	3	3
E	4	2	4	1	3	3	3	3
F	2	2	2	1	2	2	2	2
G	2	2	4	1	3	3	2	2
H	4	2	3	1	5	4	3	3
I	1	3	1	2	1	4	1	3
J	1	5	1	4	1	4	1	4
K	2	2	4	2	3	3	3	2
L	3	3	3	4	3	2	3	3

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT J

Route-services
(a)air to Belgium (b)road groupage to Belgium (c)air to France (d)road groupage to France (e)air to Holland (f)road groupage to Holland (g)air to Switzerland (h)road groupage to Switzerland

Constructs
A. Would you say that your level of knowledge about the transport service shown is (1)very high (2)quite high (3)neutral (4)quite low (5)very low

B. Difficulties with the customs in the destination country happen (1)always (2)often (3)neutral (4)seldom (5)never

C. This service is generally (1)very fast (2)quite fast (3)neutral (4)quite slow (5)very slow

D. In terms of what you get, the price of the service is (1)very inexpensive (2)quite inexpensive (3)neutral (4)quite expensive (5)very expensive

E. In terms of distance from the main international transport routes, the final destinations are (1)very remote (2)quite remote (3)neutral (4)quite near (5)very near

F. Costs of reforwarding in the destination country are (1)very high (2)quite high (3)neutral (4)quite low (5)very low

G. For urgent consignments, this service would be used (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services

	a	b	c	d	e	f	g	h
A	2	1	2	2	2	1	2	2
B	4	4	3	3	4	4	4	3
C	2	2	2	3	2	2	2	2
D	2	2	2	4	2	2	2	2
E	4	4	4	2	4	2	4	4
F	2	2	1	1	2	2	2	2
G	2	2	2	4	4	2	2	2

RESPONDENT K

Route-services
(a)scheduled air to Austria (b)charter air to Austria (c)scheduled air to Italy (d)scheduled air to Switzerland (e)road groupage to Austria (f)rail groupage to Austria (g)road groupage to Italy (h)road groupage to Switzerland

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT K (cont)

Constructs

A. For the price, the frequency of service is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. In terms of cost-effectiveness, this service is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

C. Monitoring this service is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

D. The customer's influence on using this service was (1)very great (2)quite great (3)neutral (4)quite slight (5)very slight

E. The calibre of the employees in the transport or forwarder firm with which you deal directly is (1)very good (2)quite good (3)neutral (4)quite poor (5)very poor

F. Departures from the UK are (1)very regular (2)quite regular (3)neutral (4)quite irregular (5)very irregular

G. Handling of documentation by the forwarder or operator is (1)very efficient (2)quite efficient (3)neutral (4)quite inefficient (5)very inefficient

H. Allowing for distance, compared with other services in this question, the freight rate is (1)very high (2)quite high (3)neutral (4)quite low (5)very low

I. The influence of sales representatives (from forwarders or operators) in your selecting this service was (1)very great (2)quite great (3)neutral (4)quite small (5)very small

J. This service is used when spares are required for a production line breakdown (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	1	3	1	1	2	3	2	1
B	2	2	2	2	2	2	2	2
C	1	3	1	1	3	5	3	3
D	3	3	3	3	3	3	3	3
E	1	1	1	1	2	2	2	2
F	1	2	1	1	2	3	2	2
G	1	1	1	1	2	3	2	3
H	2	3	2	2	4	4	4	4
I	4	4	4	4	4	4	4	4
J	1	5	1	1	5	5	5	5

RESPONDENT L

Route-services

(a)air to Switzerland (b)air to Italy (c)air to France (d)air to Belgium (e)road groupage to W. Germany (f)road groupage to Switzerland (g)road groupage to France (h)road groupage to Belgium

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT L (cont)

Constructs

A. The control which you are likely to keep over your goods during transit is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. The door-to-door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

C. The operator or agent you use on this service is likely to be requested by the customer (1)always (2)often (3)neutral (4)seldom (5)never

D. Delays are likely to occur in the UK at the forwarder's depot or elsewhere (1)always (2)often (3)neutral (4)seldom (5)never

E. The influence on the quality of the service resulting from the volume of business you give the forwarder is likely to be (1)very great (2)quite great (3)neutral (4)quite small (5)very small

F. Compared with the general quality of service, the cost is likely to be (1)very important (2)quite important (3)neutral (4)quite unimportant (5)very unimportant

G. The place to which you deliver in the UK (eg forwarder's depot) is, for your company, (1)very accessible (2)quite accessible (3)neutral (4)quite inaccessible (5)very inaccessible

H. The frequency of service is likely to be (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

I. The quality of on-carriage in the destination country (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

J. Customs clearance in the destination country is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

K. For urgent consignments, this service would be used (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	1	3	2	2	2	1	3	3
B	1	2	2	2	2	2	3	3
C	1	2	2	2	1	1	1	3
D	4	4	4	4	3	4	2	3
E	3	3	3	3	3	3	3	3
F	3	3	3	3	3	3	3	3
G	2	2	2	2	3	4	3	2
H	1	1	1	1	2	3	3	2
I	1	3	3	2	2	2	3	3
J	0	0	0	0	0	0	0	0
K	3	3	3	3	3	3	3	3

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT M

Route-services

(a)air to Austria (b)part load road to Austria (c)air to Belgium (d)part load road to Italy (e)air to Switzerland (f)part load road to Holland (g)air to W.Germany (h)road groupage to W.Germany

Constructs

A. For the type of service (ie road or air) the door-to-door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. Problems about documentation occur (1)always (2)often (3)neutral (4)seldom (5)never

C. Goods are despatched on the anticipated service (flight, trailer etc) (1)always (2)often (3)neutral (4)seldom (5)never

D. Delays at destination depots or airports occur (1)always (2)often (3)neutral (4)seldom (5)never

E. For the quality of service, the cost of freight is (1)very expensive (2)quite expensive (3)neutral (4)quite inexpensive (5)very inexpensive

F. Compared with other forwarders or operators on this service, the one you use is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

G. Considered as a general forwarder for a large number of destinations, the forwarder you use on this particular service is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

H. For urgent consignments, this service is used (1)always (2)often (3)neutral (4)seldom (5)never

I. The control which you are able to keep over your goods during transit is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

J. For the value of the goods sent on this service, the cost of freight is (1)very expensive (2)quite expensive (3)neutral (4)quite inexpensive (5)very inexpensive

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	2	3	2	3	2	2	1	2
B	4	4	2	3	4	4	4	4
C	1	1	1	1	1	1	1	1
D	4	3	2	3	3	4	4	4
E	3	2	2	3	3	3	4	4
F	2	1	2	2	2	1	2	1
G	4	2	4	2	4	1	4	1
H	2	5	1	5	1	3	2	4
I	3	3	3	3	2	2	2	2
J	4	3	3	3	4	4	4	4

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT N

Route-services
(a)consolidated air to Austria (b)scheduled air to France (c)scheduled air to Italy (d)scheduled air to W.Germany (e)road groupage to Austria (f)road groupage to France (g)road groupage to Italy (h)road groupage to W.Germany

Constructs
A. For the type of transport and the distance, the transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. Tracing the arrival of goods at destination is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

C. When compared with transit time, the cost of the service is (1)very high (2)quite high (3)neutral (4)quite low (5)very low

D. You use the services proposed by customers in routing orders (1)always (2)often (3)neutral (4)seldom (5)never

E. The range of quality of service offered by different forwarders or operators is (1)very wide (2)quite wide (3)neutral (4)quite narrow (5)very narrow

F. In your opinion, given the consignment sizes being sent, this type of transport is (1)very suitable (2)quite suitable (3)neutral (4)quite unsuitable (5)very unsuitable

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	3	2	2	2	1	1	3	1
B	2	1	1	1	1	1	3	1
C	2	1	1	1	3	3	3	3
D	2	2	2	2	2	2	2	2
E	4	4	4	4	4	4	4	4
F	2	4	3	4	1	1	1	1

RESPONDENT O

Route-services
(a)scheduled air to Belgium (b)scheduled air to France (c)scheduled air to Spain (d)charter air to W.Germany (e)road groupage to Belgium (f)road groupage to Holland (g)road groupage to Italy (h)road groupage to W.Germany

Constructs
A. For the type of transport and the distance, the door-to-door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. The range of quality of service offered by different forwarders or operators is (1)very wide (2)quite wide (3)neutral (4)quite narrow (5)very narrow

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT O (cont)

Constructs (cont)

C. Final delivery in the destination country to the customer is (1)very efficient (2)quite efficient (3)neutral (4)quite inefficient (5)very inefficient

D. The transmittal of documents to the customer by the agent or operator is (1)very efficient (2)quite efficient (3)neutral (4)quite inefficient (5)very inefficient

E. Goods are despatched on the anticipated day (1)always (2)often (3)neutral (4)seldom (5)never

F. In normal circumstances, for your product weight this transport service is (1)very suitable (2)quite suitable (3)neutral (4)quite unsuitable (5)very unsuitable

G. You use the services proposed by customers in routing orders (1)always (2)often (3)neutral (4)seldom (5)never

H. This service is used for urgent consignments (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A.	2	2	2	3	2	3	4	3
B	3	3	3	1	1	1	3	3
C	2	2	3	3	3	3	4	3
D	3	3	3	3	3	3	3	3
E	2	2	2	3	3	3	3	3
F	5	5	5	5	1	1	1	1
G	5	5	5	5	5	5	5	5
H	3	3	3	4	2	2	3	2

RESPONDENT P

Route-services

(a)air to France (b)road groupage to France (c)air to Italy (d)rail groupage to Italy (e)air to Switzerland (f)express van to Switzerland (g)air to W.Germany (h)road groupage to W.Germany

Constructs

A. The control which you are able to keep over your goods during transit is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

B. Your goods have tended to go astray on this service (1)always (2) often (3)neutral (4)seldom (5)never

C. Goods are despatched on the anticipated service (flight, trailer etc) (1)always (2)often (3)neutral (4)seldom (5)never

D. This service is used when consignments have to make up for lost time owing to production delays (1)always (2)often (3)neutral (4)seldom (5)never

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT P (cont)

Constructs (cont)

E. The operator or agent you use on this route is requested by the customer (1)always (2)often (3)neutral (4)seldom (5)never

F. For the distance, the door-to-door transit time is (1)very good (2)quite good (3)neutral (4)quite bad (5)very bad

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	2	3	2	4	2	1	2	3
B	5	4	4	2	4	5	4	4
C	1	2	2	2	2	1	2	2
D	0	0	0	0	0	0	0	0
E	5	1	2	1	5	5	5	5
F	2	2	2	4	2	1	2	2

RESPONDENT Q

Route-services

(a)air to France (b)road groupage to France (c)air to Holland (d)road groupage to Holland (e)air to Switzerland (f)express van to Switzerland (g)air to W.Germany (h)rail groupage to W.Germany

Constructs

A. Delivery to the operator's depot in the UK is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

B. Obtaining proof of despatch (eg certificate of shipment) is (1)very easy (2)quite easy (3)neutral (4)quite difficult (5)very difficult

C. Delivery to the customer is (1)very reliable (2)quite reliable (3)neutral (4)quite unreliable (5)very unreliable

D. Your goods have tended to get lost on this service (1)always (2)often (3)neutral (4)seldom (5)never

E. For the distance, the transit time is (1)very good (2)quite good (3)neutral (4)seldom (5)never

F. Queries about documentation are made by the forwarding agents (1)always (2)often (3)neutral (4)seldom (5)never

G. Clearance in the destination country is (1)very fast (2)quite fast (3)neutral (4)quite slow (5)very slow

H. Delays caused by transhipment occur (1)always (2)often (3)neutral (4)seldom (5)never

I. The operator or agent you use on this route is selected by the customer (1)always (2)often (3)neutral (4)seldom (5)never

JUDGEMENTS BY RESPONDENTS FOR REPERTORY GRIDS

RESPONDENT Q (cont)

Constructs (cont)

J. For the weight and volume of your consignments sent by this service, this type of transport is (1)very suitable (2)quite suitable (3)neutral (4)quite unsuitable (5)very unsuitable

K. For urgent consignments, this service is used (1)always (2)often (3)neutral (4)seldom (5)never

Repertory grid (rows = constructs, columns = route-services)

	a	b	c	d	e	f	g	h
A	5	2	1	1	2	1	1	1
B	5	2	2	1	2	1	2	1
C	5	3	1	1	2	2	1	1
D	1	3	4	5	4	5	4	5
E	5	4	1	2	1	2	1	1
F	4	3	4	5	4	5	4	4
G	5	0	2	2	2	3	2	2
H	2	0	4	4	4	5	4	5
I	1	3	4	4	4	4	4	2
J	0	0	2	2	2	2	2	2
K	1	5	1	2	1	3	1	2

APPENDIX F
(Sheet 1 of 2)

PRINCIPAL COMPONENTS ANALYSIS

Principal components analysis (PCA) is often associated with factor analysis. There are various forms of factor analysis, but the essential difference between PCA and factor analysis is that common factor analysis is concerned with defining the patterns of common variation among a set of variables whereas PCA is concerned with deriving patterns of all the variation in a set of variables, whether common or unique. Factor analysis is widely used to generate hypotheses whereas PCA is a simple data transformation. PCA is one of the oldest multivariate techniques for data analysis in use since the 1930s.

PCA summarises the observed variation in a correlation matrix,derived from the standardised variables, to a simple structure. Usually, only the major dimensions of covariation are of interest, and to obtain these, linear combinations of variables that reproduce as much as possible of the original variation in the data are produced. The first principal component is the single best summary of linear relationships revealed in the data. The second component is the second best linear combination of variables which is orthogonal to the first principal component, and only takes into account the proportion of variance not accounted for by the first component. The third component is the best linear combination of the residual variance after accounting for the first and second components, and so on.

There will be as many components as there are variables, but generally most of the variance is accounted for by a relatively small number of components. The PCA model is

$$Z_j = A_{j1}F_1 \pm A_{j2}F_2 \pm \ldots\ldots\ldots A_{jp}F_p$$

where each of the p observed variables Z_j is described linearly in terms of p new uncorrelated components $F_1, F_2 \ldots\ldots F_p$. p is equal to the number of original variables. The coefficients A are the loadings emerging from a PCA analysis, and they show the degree and direction of the relationship of a variable with a particular component. For unrotated or orthogonally rotated components the square of the loading shows the 'explained' variance of a given variable accounted for by a given component.

The eigenvalue is equal to the sum of the column of squared loadings for each component and measures the amount of variation accounted for by a component. Since PCA exhausts all variation in the original correlation matrix, the sum of the eigenvalues of all components expressed as a percentage of the total variation equals 100%. Typically, only components with eigenvalues greater than 1.00 are taken into account since this means that the component accounts for a greater amount of variation than any single variable and the objective of PCA is to obtain a parsimonious interpretation of data.

PCA produces an unrotated matrix. However, the first component tends to be a general component loading significantly on a large number of variables, and the second component tends to be bipolar with half of the variables having positive loadings and the other half negative loadings. It is therefore advisable to rotate the components. Components may be considered as axes in a p-dimensional space (p = no. of variables/components) and the loadings as the projections of vectors representing clusters of variables. Rotation of the components towards the major clusters of variables enables such clusters to be more easily identified. There

are two basic forms of rotation. Orthogonal rotation defines only uncorrelated patterns whereas oblique rotation identified patterns regardless of their correlation.

There is some debate as to whether orthogonal or oblique rotation is preferable. Oblique rotation is used in the analysis in chapter 12 since it is considered to provide a more precise definition of the boundaries of clusters of variables. Furthermore, the real world is unlikely to consist of orthogonal or uncorrelated clusters of variables. In addition, it is possible to identify the degree of correlation between obliquely rotated components.

Factor scores are the scores for each case on the components (in the case of the analysis in chapter 12 on the obliquely rotated components). The factor score for each case is obtained by multiplying the case's standardised scores on the original variables by the appropriate column of the component loading matrix. This may be expressed as

$$S_{ik} = \sum_{j=1}^{m} D_{ij} \cdot C_{jk}$$

where S_{ik} = component score for ith observation on kth component, D_{ij} = standard (z) score for ith observation on jth variable, C_{jk} = component loading of jth variable on kth component, and m = number of original variables.

Computing

The PCA analysis was undertaken by computer using the subprogram FACTOR of the Statistical Package for the Social Sciences (SPSS).

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APPENDIX G
(Sheet 1 of 1)

CONSTRUCTS WITH NO VARIATION

RESPONDENT REF.	MODAL CONTRAST	CONSTRUCT
A	A v S	When compared with transit time, cost of transport is very important/very unimportant (cost versus time)
A	A v S	Arranging despatch of goods from your premises by this service is very easy/very difficult (shipper - other than product)
G	A v S	Delays before departure from the UK occur always/never (depot delays)
H	A v S	Your goods depart on time always/never (depot delays)
K	S v S	In terms of cost-effectiveness, this service is very good/very bad (cost-other than related to time)
K	S v S	The customer's influence on using this service was very great/very slight (consignee's influence)
K	A v S	The influence of sales representatives (from forwarders or operators) in your selecting this service was very great/very small (transport contacts)
L	S v S	The influence of the quality of the service resulting from the volume of business you give the forwarder is likely to be very great/very small (transport contacts)
L	S v S	Compared with the general quality of service, the cost is likely to be very important/very unimportant (cost-other than related to time)
L	A v A	Customs clearance in the destination country is very good/very bad (clearance)
L	A v S	For urgent consignments, this service would be used always/never (urgency)
M	S v S	Goods are despatched on the anticipated service always/never (depot delays)
N	S v S	You use the services proposed by customers in routing orders always/never (consignee's influence)
N	S v S	The range of quality of service offered by different forwarders or operators is very wide/very narrow (transport contacts)
O	S v S	The transmittal of documents to the customer by the agent or operator is very efficient/very inefficient (documentation)
O	A v S	You use the services proposed by customers in routing orders always/never (consignee's influence)
P	A v A	This service is used when consignments have to make up for lost time owing to production delays always/never (urgency)
Q	A v S	For the weight and volume of your consignments sent by this service, this type of transport is very suitable/very unsuitable (product)

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT A — CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2
Handling at the destination airport or depot is v.good (q.good neutral) q.bad v.bad	-0.10	1.03
The range of quality of service of different agents is v.wide (q.wide neutral q.narrow v.narrow)	-0.87	-0.22
The service that larger agents provide compared with smaller agents is v.wide (q.wide neutral q.narrow v.narrow)	1.01	-0.18
Capital equipment involving your engineers being on site is sent by this service always (often neutral seldom) never	0.39	0.77
In terms of delivery dates given to your customer, consignments sent by this service are late leaving your premises always (often neutral) seldom never	0.51	0.06
RESPONDENT B		
This service is used in an emergency always often (neutral seldom never)	-0.23	0.75
For the cost, the speed of service is (v.good q.good neutral) q.bad v.bad	0.04	0.97
The frequency of departures from the UK is v.good (q.good neutral) q.bad v.bad	0.57	-0.28
F.o.b. charges for this service are v.high (q.high neutral) q.low v.low	0.32	-0.89
The feedback on arrival times in the destination country is v.good q.good (neutral q.bad) v.bad	0.54	0.79
Clearance in the destination country is v.good (q.good neutral) q.bad v.bad	0.98	0.00
Security of your goods on this service is (v.good q.good neutral) q.bad v.bad	0.98	0.01
The quality of equipment (eg trailers vans) used on this service is (v.good q.good neutral) q.bad v.bad	0.86	0.23
Delays waiting for available transport equipment in the UK occur always (often neutral)seldom never	-0.77	0.36

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT C — CONSTRUCT	COMPONENT NO.(LOADINGS) 1	2	3
For the type of transport and the distance, the door-to-door transit time is (v.good q.good neutral q.bad v.bad)	0.93		
Delays at destination depots or airports occur always (often neutral seldom never)	-0.92		
Customs clearance problems occur in the destination country always often (neutral seldom never)	-0.92		
Final delivery to the customer is v.efficient q.efficient neutral q.inefficient) v.inefficient	0.94		
Finding a British transport operator or forwarder with his own agent in the destination country is (v.easy q.easy neutral) q.difficult v.difficult	0.75		
For the cost the door-to-door transit time is(v.good q.good neutral) q.bad v.bad	0.95		
The clearance agent in the destination country is (v.good q.good neutral) q.bad v.bad	0.95		
RESPONDENT D			
This service is used for urgent consignments (always often neutral seldom never)	0.10	0.81	0.42
The feedback from the transport operator or agent in the destination country is (v.good q.good neutral q.bad v.bad)	0.92	0.02	-0.10
Goods are despatched on the anticipated service (flight,trailer etc) always (often neutral seldom) never	-0.04	0.89	-0.01
Cooperation between the transport operator and the customs in the destination country is v.good (q.good neutral q.bad v.bad)	0.29	0.23	-0.85
Delays at the destination depot or airport occur always (often neutral seldom) never	-0.48	-0.64	0.30
It is possible to book space on a particular departure always (often neutral seldom) never	0.61	0.40	-0.01

RESPONDENT D (cont) CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2	3
Confirmation of the departure date is received from the operator or forwarder (always often neutral) seldom never	-0.20	1.04	-0.13
Tracing consignments is (v.easy q.easy neutral q.difficult v.difficult)	0.65	0.45	-0.15
Departures from the UK are (v.regular q.regular neutral q.irregular)v.irregular	1.00	-0.30	-0.06
Obtaining proof of delivery is (v.easy q.easy neutral q.difficult) v.difficult	0.64	0.53	-0.06
For the type of transport and the distance, the door-to-door transit time is v.good (q.good neutral q.bad v.bad)	0.76	0.38	0.20
Invoicing (billing) by transport operators or forwarders is (v.efficient q.efficient neutral q.inefficient v.inefficient)	0.37	0.45	0.58
The agent or transport operator is prepared to despatch your goods without documentation from you always (often neutral seldom never)	1.01	-0.19	0.03
RESPONDENT E			
This service is (v.fast q.fast neutral) q.slow v.slow	0.88	0.21	
Your relationship with the forwarder or operator is (v.good q.good neutral) q.bad v.bad	0.95	-0.20	
The range of quality of transport operators or forwarders is (v.wide q.wide) neutral q.narrow v.narrow	0.66	0.54	
For this service, you prefer the size of your forwarder's or operator's company to be (v.big q.big neutral q.small) v.small	0.13	-0.77	
Availability of services (ie road vehicles, aircraft) on this route is (v.good q.good neutral) q.bad v.bad	0.98	-0.10	
Documentation requirements for the destination country are v.difficult q.difficult (neutral q.easy v.easy)	-0.97	0.03	
Delays through transhipment or handling happen always often (neutral seldom never)	-0.90	-0.04	
For the price paid, the total transit time is (v.good q.good neutral) q.bad v.bad	0.81	0.34	
The operator or agent you use on this route is requested by the customer (always often neutral seldom) never	0.06	0.90	

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT E (cont) CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2
The final delivery from the continental depot or airport to the final destination is (v.fast q.fast neutral) q.slow v.slow	0.92	-0.05
This service is used when goods are late or required urgently always (often neutral seldom) never	0.80	-0.16
RESPONDENT F		
The operator or agent you use on this route is requested by the customer (always often neutral seldom) never	0.89	0.32
For the quality of service the freight rate is (v.reasonable q.reasonable neutral) q.unreasonable v.unreasonable	0.92	0.05
The frequency of departure is (v.good q.good neutral) q.bad v.bad	0.65	-0.08
Customs clearance in the destination country is (v.good q.good neutral) q.bad v.bad	0.60	-0.68
Damage to your goods using this service happens always often (neutral seldom never)	-0.90	0.24
Transport documentation problems happen always often (neutral seldom never)	-0.80	0.52
The influence on the quality of service resulting from the volume of business you give the operator or forwarder is (v.great q.great neutral q.small v.small)	0.83	0.10
The delivery of documents to the agent in the destination country is (v.efficient q.efficient neutral) q.inefficient v.inefficient	0.94	0.04
For urgent consignments (eg spare parts for broken machinery) this service is used (always often neutral seldom never)	-0.35	-0.76
Taking into account your products' weight, volume and value this service is (v.suitable q.suitable neutral) q.unsuitable v.unsuitable	0.86	0.27

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT G — CONSTRUCT	COMPONENT NO.(LOADINGS) 1	2	3
Clearance facilities in the destination country for this service are (v.good q.good neutral) q.bad v.bad	0.87	-0.11	-0.20
Arranging transport to final destinations away from the main centres is (v.easy q.easy neutral)q.difficult v.difficult	0.79	-0.13	0.21
Delays at depots or airports happen always often (neutral seldom) never	-0.92	0.09	0.20
Arranging documentation is (v.easy q.easy neutral) q.difficult v.difficult	1.00	0.14	0.05
The range of carriers to choose from is v.narrow (q.narrow neutral q.wide v.wide)	0.06	0.97	-0.14
The range of freight rates charged by different carriers for a similar service is v.narrow (q.narrow neutral q.wide v.wide)	0.48	0.98	0.06
The workload for you or your department in arranging the transport is very much more than average (somewhat more than average neutral somewhat less than average) very much less than average	-1.00	-0.14	-0.05
This service is used for urgent consignments always (often neutral seldom) never	-0.06	-0.08	0.92
In terms of adapting to unforeseen circumstances (eg strikes, bad weather) the service is v.flexible (q.flexible neutral) q.inflexible v.inflexible	0.36	-0.75	0.31
For the type of transport and the distance, the door-to-door transit time is (v.good q.good neutral) q.bad v.bad	0.42	-0.77	-0.32
For the type of transport and the distance, the cost of freight is v.high q.high (neutral q.low) v.low	-0.36	0.75	-0.31
RESPONDENT H			
For the type of service the best available rates are v.high q.high (neutral q.low) v.low	0.43	0.86	0.05
For the type of service the total transit time is (v.fast q.fast neutral) q.slow v.slow	0.23	-0.93	-0.15
Problems in the destination country during transport occur always often (neutral seldom never)	-0.84	0.36	-0.17

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT H (cont) CONSTRUCT	COMPONENT NO.(LOADINGS) 1	2	3
You are likely to be informed of problems in the destination country by the transport operator or forwarder (always,often,neutral,seldom,never)	0.76	0.22	0.44
The work involved for your department when sending a single consignment by this service is v.much quite a lot (neutral quite little) hardly any	-0.99	-0.24	0.24
Collection of goods from your premises by the transport operator or forwarder is (v.good q.good) neutral q.bad v.bad	-0.02	-0.16	0.86
Queries about transport documentation occur always often (neutral seldom never)	-0.84	0.36	-0.17
There are problems with customs at the destination always often (neutral seldom never)	-0.10	0.73	-0.35
This service is used in an emergency (always often neutral seldom) never	0.33	-0.10	0.80
Taking only costs into consideration, this service is v.expensive (q.expensive neutral) q.inexpensive v.inexpensive	-0.13	0.55	0.78
RESPONDENT I			
Taking only costs into consideration this service is v.expensive (q.expensive neutral q.inexpensive v.inexpensive)	-0.72	0.47	-0.12
Departures from the UK are (v.regular q.regular) neutral q.irregular v.irregular	0.08	-0.79	0.11
If there is a panic shipment, the influence your forwarding agent would have on the continental clearance agent is v.large (q.large neutral q.small)v.small	-0.04	0.01	0.98
The influence of the amount of your business, which you give the forwarder or operator, on his quality of service is (v.large q.large neutral q.small) v.small	0.87	-0.13	0.08
Competition between forwarders is (v.heavy q.heavy neutral q.light) v.light	0.70	-0.34	0.15
Finding a forwarder or operator who specialises to this country is (v.important q.important) neutral q.unimportant v.unimportant	0.92	0.08	0.01
Cooperation from your forwarder or operator is (v.good q.good neutral q.bad) v.bad	0.25	0.09	0.83
Your experience of this service is (v.large q.large neutral q.limited v.limited)	0.95	-0.08	-0.09
This service is used for urgent shipments (always often neutral seldom) never	0.09	0.99	0.01

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT I (cont) CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2	3
This service is used for samples (always often neutral seldom never)	-0.27	0.84	-0.12
For the type of transport the transit time is v.good (q.good neutral q.bad)v.bad	-0.13	-0.12	1.00
FOB charges for this service are v.high (q.high neutral q.low) v.low	-0.79	-0.52	-0.19
RESPONDENT J			
Would you say that your level of knowledge about the transport service shown is (v.high q.high) neutral q.low v.low	-0.08	0.90	
Difficulties with the customs in the destination country happen always often (neutral seldom) never	-0.35	-0.68	
This service is generally v.fast (q.fast neutral) q.slow v.slow	0.95	0.10	
In terms of what you get, the price of this service is v.inexpensive (q.inexpensive neutral q.expensive)v.expensive	0.95	0.10	
In terms of distance from the main international transport routes, the final destinations are v.remote (q.remote neutral q.near) v.near	-0.88	0.51	
Costs of reforwarding in the destination country are (v.high q.high) neutral q.low v.low	-0.59	-0.49	
For urgent consignments, this service would be used always (often neutral seldom) never	0.65	0.13	
RESPONDENT K			
For the price, the frequency of service is (v.good q.good neutral)q.bad v.bad	-0.10	1.04	
Monitoring this service is (v.easy q.easy neutral q.difficult v.difficult)	0.58	0.58	
The calibre of the employees in the transport or forwarder firm with which you deal directly is (v.good q.good) neutral q.poor v.poor	1.03	-0.13	
Departures from the UK are (v.regular q.regular neutral) q.irregular v.irregular	0.58	0.58	

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT K (cont) CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2
Handling of documentation by the forwarder or operator is (v.efficient q.efficient neutral) q.inefficient v.inefficient	1.02	-0.13
Allowing for distance, compared with other services in this question, the freight rate is v.high (q.high neutral q.low) v.low	0.88	0.18
This service is used when spares are required for a production line breakdown (always often neutral seldom never)	0.62	0.47
RESPONDENT L		
The control which you are likely to keep over your goods during transit is (v.good q.good neutral) q.bad v.bad	0.93	-0.21
The door-to-door transit time is (v.good q.good neutral) q.bad v.bad	0.94	0.26
The operator or agent you use on this service is likely to be requested by the customer (always often neutral) seldom never	0.56	-0.70
Delays are likely to occur in the UK at the forwarder's depot or elsewhere always (often neutral seldom) never	-0.66	-0.54
The place to which you deliver in the UK (eg forwarder's depot) is, for your company, v.accessible (q.accessible neutral q.inaccessible) v.inaccessible	-0.13	0.93
The frequency of service is likely to be (v.good q.good neutral) q.bad v.bad	0.30	0.92
The quality of on-carriage in the destination country is (v.good q.good neutral) q.bad v.bad	0.89	-0.12
RESPONDENT M		
For the type of service (ie road or air) the door-to-door transit time is (v.good q.good neutral) q.bad v.bad	-0.68	0.64
Problems about documentation occur always (often neutral seldom) never	0.76	0.33
Delays at destination depots or airports occur always (often neutral seldom) never	0.87	0.26
For the quality of service, the cost of freight is v.expensive (q.expensive neutral q.inexpensive) v.inexpensive	0.85	-0.03

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT M (cont) CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2	3
Compered with other forwarders or operators on this service, the one you use is (v.good q.good)neutral q.bad v.bad	-0.22	-0.83	
Considered as a general forwarder for a large number of destinations, the forwarder you use on this particular service is (v.good q.good neutral q.bad)v.bad	-0.13	-0.92	
For urgent consignments, this service is used (always often neutral seldom never)	-0.17	0.90	
The control which you are able to keep over your goods during transit is v.good (q.good neutral) q.bad v.bad	-0.85	-0.04	
For the value of the goods sent on this service, the cost of freight is v.expensive q.expensive (neutral q.inexpensive v.inexpensive)	0.94	-0.20	
RESPONDENT N			
For the type of transport and the distance, the transit time is (v.good q.good neutral) q.bad v.bad	-0.31	0.95	
Tracing the arrival of goods at destination is (v.easy q.easy neutral) q.difficult v.difficult	0.32	0.94	
When compared with the transit time, the cost of the service is (v.high q,high neutral) q.low v.low	0.99	-0.02	
In your opinion, given the consignment sizes being sent, this type of transport is (v.suitable q.suitable neutral q.unsuitable) v.unsuitable	-0.99	-0.02	
RESPONDENT O			
For the type of transport and the distance, the door-to-door transit time is v.good (q.good neutral q.bad) v.bad	1.00	0.11	0.09
The range of quality of service offered by different forwarders or operators is (v.wide q.wide neutral) q.narrow v.narrow	0.08	-0.06	1.02
Final delivery in the destination country to the customer is v.efficient (q.efficient neutral q.inefficient) v.inefficient	0.92	-0.03	0.00
Goods are despatched on the anticipated day always (often neutral) seldom never	0.63	-0.20	-0.50

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT O (cont) CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2	3
In normal circumstances, for your product weight this transport service is (v.suitable q.suitable neutral q.unsuitable) v.unsuitable	-0.48	0.74	0.07
This service is used for urgent consignments always (often neutral seldom) never	0.18	1.03	-0.05
RESPONDENT P			
The control which you are able to keep over your goods during transit is (v.good q.good neutral q.bad) v.bad	0.93		
Your goods have tended to go astray on this service always (often neutral seldom never)	-0.96		
Goods are despatched on the anticipated service (flight, trailer etc) (always often) neutral seldom never	0.72		
The operator or agent you use on this route is requested by the customer (always often neutral seldom never)	-0.76		
For the distance, the door-to-door transit time is (v.good q.good neutral q.bad) v.bad	0.91		
RESPONDENT Q			
Delivery to the operator's depot in the UK is (v.easy q.easy neutral q.difficult v.difficult)	0.99	-0.07	
Obtaining proof of despatch (eg certificate of shipment) is (v.easy q.easy neutral q.difficult v.difficult	0.99	-0.21	
Delivery to the customer is (v.reliable q.reliable neutral q.unreliable v.unreliable)	0.92	-0.19	
Your goods have tended to get lost on this service (always often neutral seldom never)	-0.96	-0.04	
For the distance the transit time is (v.good q.good neutral q.bad v.bad)	0.80	0.40	
Queries about documentation are made by the forwarding agents always often (neutral seldom never)	-0.27	-0.56	
Clearance in the destination country is v.fast (q.fast neutral q.slow v.slow)	0.91	-0.03	

RELATIONSHIP BETWEEN COMPONENTS AND CONSTRUCTS BY RESPONDENT

RESPONDENT Q (cont) CONSTRUCT	COMPONENT NO. (LOADINGS) 1	2
Delays caused by transhipment occur always (often neutral seldom never)	-0.94	0.27
The operator or agent you use on this route is selected by the customer (always often neutral seldom) never	-0.75	-0.13
For urgent consignments, this service is used (always often neutral seldom never)	-0.22	0.97

CLASSIFICATION OF FACTOR SCORES

EXPLANATION OF FORMAT

Each respondent has one, two or three components (see text of chapter....). Each route-service has a factor score on each component.

Each component has a matrix of 12 columns by 8 rows. Each column gives the following information about a route-service for the relevant component, and each row represents a route-service.

Columns

1-5	Factor score (may be negative). Right justified decimal point with three following digits (Fortran fixed format F5.3) eg Respondent A, component 1, first route-service factor score is -1.303
6	Blank
7	Evaluative component: 1 = yes, 2 = no
8	Intermodal component: 1 = yes, 2 = no
9	Preference component: 1 = yes, 2 = no
10	Blank
11	Mode: 1 = air, 2 = surface
12	Preference: 1 = most preferred, 2 = least preferred 3 = neutral

RESPONDENT A

COMPONENT 1			COMPONENT 2		
-1323	212	11	-638	112	11
-667	212	12	-635	112	12
-667	212	11	-635	112	11
-667	212	11	-535	112	11
-97	212	23	-330	112	23
1080	212	22	-330	112	21
1171	212	23	1465	112	22
1171	212	21	1738	112	23

RESPONDENT B

COMPONENT 1			COMPONENT 2		
-1062	122	21	-1809	112	21
-762	122	11	-905	112	22
-762	122	12	-582	112	23
-762	122	13	450	112	23
-73	122	23	659	112	11
828	122	13	659	112	12
1099	122	23	659	112	13
1494	122	22	969	112	13

RESPONDENT C

COMPONENT 1		
-1238	121	11
-867	121	13
-761	121	23
-255	121	21
-190	121	13
724	121	23
1005	121	12
1591	121	22

RESPONDENT D

COMPONENT 1			COMPONENT 2			COMPONENT 3		
-1931	121	21	-1368	121	11	2164	122	12
-793	121	11	-1359	121	13	386	122	13
77	121	13	-720	121	13	26	122	13
98	121	12	300	121	21	-20	122	23
109	121	13	405	121	12	-177	122	23
232	121	23	898	121	23	-400	122	11
853	121	23	900	121	23	-890	122	21
1355	121	22	945	121	22	-1089	122	22

RESPONDENT E

COMPONENT 1			COMPONENT 2		
-778	122	21	-1466	212	22
-702	122	22	-645	212	21
-672	122	13	-556	212	23
-412	122	13	-95	212	23
-391	122	11	-24	212	13
-158	122	23	368	212	11
1198	122	12	471	212	12
1915	122	23	1939	212	13

RESPONDENT F

COMPONENT 1			COMPONENT 2		
-1254	121	21	-1957	212	22
-1113	121	11	-899	212	23
-1085	121	23	-45	212	21
-5	121	22	-3	212	23
724	121	13	315	212	12
823	121	23	762	212	13
910	121	13	838	212	13
930	121	12	988	212	11

RESPONDENT G

COMPONENT 1			COMPONENT 2			COMPONENT 3		
-791	121	23	1159	112	13	-1321	221	13
-787	121	21	869	112	11	-1055	221	23
-493	121	13	798	112	12	-673	221	21
-434	121	11	766	112	13	-270	221	11
-297	121	12	-436	112	22	149	221	23
-230	121	23	-771	112	23	713	221	22
974	121	13	-1172	112	21	1145	221	12
2058	121	22	-1223	112	23	1323	221	13

RESPONDENT H

COMPONENT 1			COMPONENT 2			COMPONENT 3		
-1658	122	23	1416	121	22	-1288	212	13
-727	122	11	1058	121	13	-1086	212	13
-296	122	12	708	121	13	-480	212	12
-48	122	13	-49	121	23	-469	212	11
-34	122	13	-140	121	12	186	212	21
353	122	21	-706	121	23	782	212	23
556	122	22	-800	121	21	796	212	23
1754	122	23	-1488	121	11	1559	212	22

RESPONDENT I

COMPONENT 1			COMPONENT 2			COMPONENT 3		
-2252	222	21	-1083	212	11	-1167	121	21
-483	222	23	-989	212	13	-821	121	11
156	222	13	-949	212	12	-814	121	23
174	222	23	-422	212	13	-314	121	23
235	222	12	217	212	21	220	121	13
542	222	11	723	212	23	399	121	13
723	222	22	1065	212	23	384	121	22
806	222	13	1437	212	22	1912	121	12

RESPONDENT J

COMPONENT 1			COMPONENT 2		
-611	121	13	-1780	221	23
-611	121	13	-1080	221	21
-472	121	23	18	221	13
-472	121	21	18	221	13
-215	121	11	107	221	11
-147	121	12	722	221	23
-135	121	23	732	221	22
2392	121	22	1263	221	12

RESPONDENT K

COMPONENT 1			COMPONENT 2		
-1022	212	11	-929	121	11
-1022	212	13	-929	121	13
-1022	212	13	-929	121	13
-577	212	12	-560	121	23
676	212	21	267	121	21
676	212	23	267	121	23
1138	212	22	1405	121	22
1152	212	23	1408	121	12

RESPONDENT L

COMPONENT 1			COMPONENT 2		
-1647	122	11	-954	122	12
-797	122	23	-851	122	13
-309	122	13	-790	122	13
-249	122	23	-511	122	21
46	122	13	-387	122	11
374	122	12	717	122	23
1208	122	22	1350	122	22
1375	122	21	1417	122	23

RESPONDENT M

COMPONENT 1			COMPONENT 2		
1496	121	12	-1191	112	12
996	121	23	-935	112	11
913	121	22	-908	112	13
-217	121	13	-586	112	13
-337	121	13	584	112	23
-751	121	23	787	112	23
-995	121	21	965	112	21
-1105	121	11	1284	112	22

RESPONDENT N

COMPONENT 1			COMPONENT 2		
-1247	112	11	-830	121	23
1247	112	13	-830	121	23
911	112	13	-830	121	21
87	112	12	-183	121	11
-861	112	23	-183	121	13
-861	112	23	-175	121	13
-861	112	21	1165	121	12
-910	112	22	1866	121	22

RESPONDENT O

COMPONENT 1			COMPONENT 2			COMPONENT 3		
-1162	121	11	-1160	112	23	-1257	222	23
-1162	121	13	-1098	112	23	-1210	222	12
-580	121	13	-1002	112	21	-1104	222	21
-208	121	23	4	112	22	432	222	23
351	121	21	541	112	11	612	222	22
414	121	12	541	112	13	819	222	11
516	121	23	588	112	13	819	222	13
1832	121	22	1586	112	12	900	222	13

RESPONDENT P

COMPONENT 1		
-1448	121	21
-880	121	11
-182	121	12
-182	121	12
91	121	23
139	121	12
519	121	23
1941	121	22

RESPONDENT Q

COMPONENT 1	COMPONENT 2
-511 121 23	-645 222 11
-589 121 21	-645 222 13
-561 121 23	-596 222 13
-387 121 11	-522 222 23
-387 121 13	-267 222 12
-185 121 13	160 222 23
377 121 22	190 222 21
2343 121 12	2325 222 22

RESPONDENT (COMPONENT)	CONSTRUCTS WITH HIGHEST LOADINGS ON INTERMODAL COMPONENTS	LOADING
A (1)	The service that larger agents provide compared with smaller agents is (q.wide neutral q.narrow v.narrow) (TRANSPORT CONTACTS)	1.01
A (1)	The range of quality of service of different agents is (v.narrow q.narrow neutral q.wide) (TRANSPORT CONTACTS)	0.87
A (2)	Handling at the destination airport or depot is (q.good neutral) (DEPOT DELAYS)	1.03
B (2)	For the cost, the speed of service is (v.good q.good neutral) (COST v TIME)	0.97
B (2)	F.o.b. charges for this service are (q.high neutral)(COST-OTHER THAN RELATED TO TIME)	0.89
E (2)	The operator or agent you use on this route is requested by the customer (seldom neutral often always) (CONSIGNEE'S INFLUENCE)	0.90
E (2)	For this service, you prefer the size of your forwarder's or operator's company to be (v.big q.big neutral q.small) (TRANSPORT CONTACTS)	0.77
F (2)	For urgent consignments (eg spare parts for broken machinery) this service is used (always often neutral seldom never) (URGENCY)	0.76
F (2)	Customs clearance in the destination country is (v.good q.good neutral) (CLEARANCE)	0.68
G (2)	The range of freight rates charged by different carriers for a similar service is (q.narrow neutral q.wide v.wide) (COST-OTHER THAN RELATED TO TIME)	0.98
G (2)	The range of carriers to choose from is (q.narrow neutral q.wide v.wide) (TRANSPORT CONTACTS)	0.97
H (3)	Collection of goods from your premises by the transport operator or forwarder is (v.good q.good) (FREQUENCY OF DEPARTURE)	0.86
H (3)	This service is used in an emergency (always often neutral seldom) (URGENCY)	0.80
H (3)	Taking only costs into consideration, this service is (q.expensive neutral) (COST - OTHER THAN RELATED TO TIME)	0.78

RESPONDENT (COMPONENT)	CONSTRUCTS WITH HIGHEST LOADINGS ON INTERMODAL COMPONENTS	LOADING
I (2)	This service is used for urgent shipments (always often neutral seldom) (URGENCY)	0.99
I (2)	This service is used for samples (always often neutral seldom never) (PRODUCT)	0.84
J (2)	Departures from the UK are (q.regular v.regular) (FREQUENCY OF DEPARTURE)	0.79
K (1)	The calibre of the employees in the transport or forwarder firm with which you deal directly is (v.good q.good) (TRANSPORT CONTACTS)	1.03
K (1)	Handling of documentation by the forwarder or operator is (v.efficient q.efficient neutral) (DOCUMENTATION)	1.02
K (1)	Allowing for distance, compared with other services in this question, the freight rate is (q.high neutral q.low) (COST - OTHER THAN RELATED TO TIME)	0.88
M (2)	Considered as a general forwarder for a large number of destinations, the forwarder you use on this particular service is (q.bad neutral q.good v.good) (TRANSPORT CONTACTS)	0.92
M (2)	For urgent consignments, this service is used (always often neutral seldom never) (URGENCY)	0.90
M (2)	Compared with other forwarders or operators on this service, the one you use is (q.good v.good) (TRANSPORT CONTACTS)	0.83
N (1)	When compared with the transit time, the cost of the service is (v.high q.high neutral) (COST VERSUS TIME)	0.99
N (1)	In your opinion, given the consignment sizes being sent, this type of transport is (q.unsuitable neutral q.suitable v.suitable) (PRODUCT)	0.99
O (2)	This service is used for urgent consignments (seldom neutral often) (URGENCY)	1.03
O (2)	In normal circumstances, for your product weight, this transport service is (q.unsuitable neutral q.suitable v.suitable) (PRODUCT)	0.74

RESPONDENT (COMPONENT)	CONSTRUCTS WITH HIGHEST LOADINGS ON PREFERENCE COMPONENTS	LOADING
C (1)	For the cost the door-to-door transit time is (v.good q.good neutral) (COST versus TIME)	0.95
C (1)	The clearance agent in the destination country is (v.good q.good neutral)(TRANSPORT CONTACTS)	0.95
C (1)	For the type of transport and the distance, the door-to-door transit time is (v.good q.good neutral q.bad v.bad) (DISTANCE VERSUS TIME)	0.93
C (1)	Delays at destination depots or airports occur (never seldom neutral often) (DEPOT DELAYS)	0.92
C (1)	Customs clearance problems occur in the destination country (never seldom neutral) (CLEARANCE)	0.92
D (1)	The agent or transport operator is prepared to despatch your goods without documentation from you (often neutral seldom never) (DOCUMENTATION)	1.01
D (1)	Departures from the UK are (v.regular q.regular neutral q.irregular) (FREQUENCY OF DEPARTURE)	1.00
D (1)	The feedback from the transport operator or agent in the destination country is (v.good q.good neutral q.bad v.bad) (MONITORING AND CONTROL)	0.92
D (2)	Confirmation of the departure date is received from the operator or forwarder (always often neutral) (MONITORING AND CONTROL)	1.04
D (2)	Goods are despatched on the anticipated service (flight, trailer etc) (often neutral seldom) (DEPOT DELAYS)	0.89
D (2)	This service is used for urgent consignments (always often neutral seldom never) (URGENCY)	0.81
F (1)	The delivery of documents to the agent in the destination country is (v.efficient q.efficient neutral) (DOCUMENTATION)	0.94
F (1)	For the quality of service the freight rate is (v.reasonable q.reasonable neutral) (COST - OTHER THAN RELATED TO TIME)	0.92
F (1)	Damage to your goods using this service happens (never seldom neutral) (SECURITY,DAMAGE,LOSS)	0.90
F (1)	The operator or agent you use on this route is requested by the customer (always often neutral seldom) (CONSIGNEE'S INFLUENCE)	0.89
F (1)	Taking into account your products' weight, volume and value this service is (v.suitable q.suitable neutral) (PRODUCT)	0.86
F (1)	The influence on the quality of service resulting from the volume of business you give the operator or forwarder is (v.great q.great neutral q.small v.small)(TRANSPORT CONTACTS)	0.83
F (1)	Transport documentation problems happen (never seldom neutral) (DOCUMENTATION)	0.80

RESPONDENT (COMPONENT)	CONSTRUCTS WITH HIGHEST LOADINGS ON PREFERENCE COMPONENTS	LOADING
G (1)	Arranging documentation is (v.easy q.easy neutral) (DOCUMENTATION)	1.00
G (1)	The workload for you or your department in arranging the transport is(very much less than average, somewhat less than average, neutral, somewhat more than average) (SHIPPER - OTHER THAN PRODUCT)	1.00
G (1)	Delays at depots or airports happen (neutral seldom) (DEPOT DELAYS)	0.92
G (1)	Clearance facilities in the destination country for this service are (v.good q.good neutral) (CLEARANCE)	0.87
G (3)	This service is used for urgent consignments (often neutral seldom) (URGENCY)	0.92
H (2)	For the type of service the total transit time is (v.fast q.fast neutral) (TIME - OTHER THAN RELATED TO DISTANCE OR COST)	0.93
H (2)	For the type of service the best available rates are (q.low neutral) (COST - OTHER THAN RELATED TO TIME)	0.86
I (3)	For the type of transport the transit time is (q.good neutral q.bad) (TIME - OTHER THAN RELATED TO DISTANCE OR COST)	1.00
I (3)	If there is a panic shipment, the influence your forwarding agent would have on the continental clearance agent is (q.large neutral q.small) (TRANSPORT CONTACTS)	0.98
I (3)	Cooperation from your forwarder or operator is (v.good q.good neutral q.bad)	0.83
J (1)	This service is generally (q.fast neutral) (TIME - OTHER THAN RELATED TO DISTANCE OR COST)	0.95
J (1)	In terms of what you get, the price of this service is (q.inexpensive neutral q.expensive) (COST - OTHER THAN RELATED TO TIME)	0.95
J (1)	In terms of distance from the main international transport routes, the final destinations are (q.near neutral q.remote) (FINAL DELIVERY)	0.88
J (2)	Would you say that your level of knowledge about the transport service shown is (v.high q.high) (SHIPPER - OTHER THAN PRODUCT)	0.90
K (2)	For the price, the frequency of service is (v.good q.good neutral) (FREQUENCY OF DEPARTURE)	1.04
M (1)	For the value of the goods sent on this service, the cost of freight is (v.inexpensive q.inexpensive neutral) (PRODUCT)	0.94
M (1)	Delays at destination depots or airports occur (seldom neutral often) (DEPOT DELAYS)	0.87

RESPONDENT (COMPONENT)	CONSTRUCTS WITH HIGHEST LOADINGS ON PREFERENCE COMPONENTS	LOADING
M (1)	For the quality of service, the cost of freight is (q.inexpensive neutral q.expensive) (COST - OTHER THAN RELATED TO TIME)	0.85
M (1)	The control which you are able to keep over your goods during transit is (q.good neutral) (MONITORING AND CONTROL)	0.85
N (2)	For the type of transport and the distance, the transit time is (v.good q.good neutral) (DISTANCE versus TIME)	0.95
N (2)	Tracing the arrival of goods at destination is (v.easy q.easy neutral) (MONITORING & CONTROL)	0.94
O (1)	For the type of transport and the distance, the door-to-door transit time is (q.good neutral q.bad) (DISTANCE versus TIME)	1.00
O (1)	Final delivery in the destination country to the customer is (q.efficient neutral q.inefficient) (FINAL DELIVERY)	0.92
P (1)	Your goods have tended to go astray on this service (never seldom neutral often) (SECURITY, DAMAGE, LOSS)	0.96
P (1)	The control which you are able to keep over your goods during transit is (v.good q.good neutral q.bad) (MONITORING AND CONTROL)	0.93
P (1)	For the distance, the door-to-door transit time is (v.good q.good neutral q.bad) (DISTANCE versus TIME)	0.91
Q (1)	Delivery to the operator's depot in the UK is (v.easy q.easy neutral q.difficult v.difficult) (DEPOT DELAYS)	0.99
Q (1)	Obtaining proof of despatch (eg certificate of shipment) is (v.easy q.easy neutral q.difficult v.difficult) (MONITORING AND CONTROL)	0.99
Q (1)	Your goods have tended to get lost on this service (never seldom neutral often always) (SECURITY, DAMAGE, LOSS)	0.96
Q (1)	Delays caused by transhipment occur (never seldom neutral often) (DEPOT DELAYS)	0.94
Q (1)	Delivery to the customer is (v.reliable q.reliable neutral q.unreliable v.unreliable) (FINAL DELIVERY)	0.92
Q (1)	Clearance in the destination country is (q.fast neutral q.slow v.slow) (CLEARANCE)	0.91
Q (1)	For the distance the transit time is (v.good q.good neutral q.bad v.bad) (DISTANCE v. TIME)	0.80

FILE NAME	RGSUPC
VARIABLE LIST	V1 TO V43,AIRPRO
N OF CASES	154
INPUT FORMAT	FIXED(F1.0,F2.0,8F1.0,F3.0,F5.0,F1.0,2F5.0,F3.1,3F1.0,F3.1, 3F2.0,3F1.0,F3.1,2F2.0,2F1.0,F2.0,4F1.0,F3.0,F4.0,F3.0,2F1.0, F4.0,F1.0/F4.3,X)
INPUT MEDIUM	[RGSUPD]
VAR LABELS	V1 PROPN TIME TO EXPSHIP/V2 CASE REF/V3 COUNTRY/V4 MODE/ V5 SUBMODE/V6 PREFERENCE/V7 OPERATOR GENSPEC/V8 OPERATOR FFOTHER/ V9 OPERATOR SIZE/V10 TERMS OF SALE/V11 NO OF SHIPMENTS/V12 ML CON S WEIGHT/V13 GAVE FREIGHT RATE/V14 EXWVALKG/V15 EXWVALCM/ V16 CUMPERKG/V17 NOFEMPL/V18 >1 DEST IN COUNTRY/V19 CUSTOMER TYPE /V20 TOTAL TT MEAN/V21 HIGHEST TT/V22 LOWEST TT/V23 RANGE TT/ V24 NOF OPERATORS/V25 TIME USED OPERATOR/V26 COMBINATION OPERATOR S/V27 LEAD TIME MEAN/V28 HIGHEST LEAD TIME/V29 LOWEST LEAD TIME/ V30 REG REPEAT ORDERS/V31 FREQUENCY OF DEPARTURE/V32 RANGE LEAD TIMES/V33 CHANGE MODE/V34 CHANGE OPERATOR/V35 EXPORT TURNOVER/ V36 EXPORT CONSIGNMENTS/V37 EXW TO UKDEPOT DISTANCE/V38 INTERNAT DISTANCE/V39 FINAL DELIVERY DISTANCE/V40 SURF FREIGHT RATE LEVEL/ V41 MODE DETAILS REQUIRED/V42 TOTAL DISTANCE/V43 COLLECT /AIRPRO AIR OVER SURF SHIPM
VALUE LABELS	V1 (1)0 (2)<25 (3)26-50 (4)51-75 (5)76-100/V3 (1)AUS (2)BELG (3)FRA (4)ITALY (5)HOL (6)SPAIN (7)SWITZ (8)WG/V4 (1)AIR (2)SURF/ V5 (1)ROAD GROUPAGE (2)ROAD PLOAD (3)EXPVAN (4)RAIL (5)SCHEDAIR (6)OTHER AIR/V6 (1)MPA (2)LPA (3)MPS (4)LPS (5)OTHER AIR (6)OTHER SURFACE/V7 (1)GENERAL (2)SPECIALIST/V8 (1)FRFORWARDER (2)OTHER/ V9 (1)LARGE (2)SMALL (3)UNSPECIFIED/V10 (1)EXW (2)FOB (3)CIF (4)DELDOM (5)MORE THAN ONE/V13 (1)YES (2)COMMENTS (3)NOT KNOWN EN TERED (4)BLANK/V18 (1)YES (2)NO/V19 (1)RETAILER (2)WHOLESALER (3)MANUFACTURER (4)DIVN OF OWN CO (5)MORE THAN ONE (6)OTHER/ V25 (1)0-6MONTHS (2)7-12MONTHS (3)1-2YR (4)3-4YR (5)5-6YR (6)7-9YR (7)10PLUS YR/V30 (1)<25 (2)26-50 (3)51-75 (4)76-100/ V31 (1)DAILY (2)4PW (3)3PW (4)2PW (5)1PW (6)<1PW (7)VARIES/ V33 TO V34 (1)DECIDE ALONE (2)WITH CUSTOMER (3)WITH COLLEAGUES (4)NOT INVOLVED/V40 (1)BELOW RANGE (2)MIN-MEAN (3)MEAN-MAX (4)ABO VE RANGE/V41 (1)ONLY AIR (2)ONLY SURFACE (3)BOTH AIR AND SURFACE/ V43 (1)DAILY (2)4PW (3)3PW (4)2PW (5)1PW (6)OCCASIONALLY (7)NEVER
MISSING VALUES	V1 TO V8(0),V9(0,3),V10(0,5),V11 TO V30(0),V31(0,7),V32 TO V43(0),AIRPRO(3)

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43212242212  2 90001 5000 2500 20 22 60 6 6 1144130131331 12272 401200 10 312501
07783
45282252212 201900001 5000 2500 20 12 50 5 5 1444130131331 12272 20 450 10 3 4801
07784
23371612133  4   503 5000        22 70 7 7 1174 70 8 621 32323 10 700 20 3 7301
08001
23372131153  7  1441 5000        22 8510 7 4174 70 8 615 32323 10 700 20 3 7301
08002
23341522233  3   301 5000        22 70 7 7 1174 70 8 621 32323 10 900 10 3 9301
08003
5343155    156  100120000 7060 28 12 10 1 1 1136 20 3 111 33112 10 150500 1 6606
25681
5344152223   6   2220000 7060 28 12 10 1 1 1136 20 3 112 33112 101250 10 112706
25682
5345151213  91  150120000 7060 28 12 10 1 1 1136 20 3 111 33112 10 250120 1 3806
25683
5348155    10   2120000 7060 28 12 20 2 2 1136 20 3 111 33112 10          1    6
25684
```

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2353155      1      3 3000 6000 05622 25 2 3 214          11  3222 10 300 10 3 3206
00311
23582131122 63      3 3000 6000 05612 35 3 4 223          34  3222 45 600 10 3 6557
00312
33522132214  3 17001 5000 7143 07523 20 2 2 1137 35 4 347 21143 30 250    2    6
00301
33632142214 20 15001 5000 7143 07513100101O 1417 45 5 423 21143 30 300 10 2 3407
00302
3372214      5  4503 1400 1037 14513 8510 7 4149 70 8 61  31122 45         2    7
00301
3375216      4  6003 1400 1037 14512 8510 7 4149 70 8 61  31122 45         2    7
00302
3373223     10 45003 1400 1037 14512 60 6 6 1139 60 6 643 13322 45 300     2    7
00303
33782262224 10 60003 1400 1037 14523 30 3 3 1139 60 6 642 13322 15         2    6
00304
3383155      4   801                423 70 7 7 1136 9010 83  31111 15 350 10 1 3756
30001
3387155      2  1001                422 8510 7 4236 9010 83  31111 15 700 10 1 7256
30002
33912231113  6 15001 3500  500 70412 70 8 6 3249 20 2 234 12112150110017342142 36
00301
33922141123  2  6001 3500  500 70422 40 4 4 1239 50 6 421 32112 10 200   42   6
00302
3393216      4 16001 3500  500 70412 20 2 2 1149 15 2 141 22112 10 300 1042 3201
00303
3395216      4  8001 3500  500 70412 40 4 4 1329 50 6 421 32112150 30016542 6156
00304
2402216      5     3 3500          412 80 8 8 1149 35 4 324 22212 20 300 20 2 3406
00301
24052131121  6  1003 3500          4121401414 1169 65 7 635 22212 20 300    2    6
00302
2407216      6     3 3500          4121401414 1149 45 5 435 22212 20 700 75 2 7956
00303
24082141121  8  1003 3500          4121451712 6179 35 4 344 22212 20 600    2    6
00304
3411155     11   203                914 15 2 1 2176 25 3 24  22387 201100 10 111307
26681
3415155     49   203                912 15 2 1 2176 25 3 24  22387 20 300 10 1 3307
26682
3417155     31   203                914 15 2 1 2176 25 3 24  22387 20 700 10 1 7307
26683
```

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5118155      51   205              912 15 2 1 2176 25 3 24  22387 20 600 10 1 6307
25684
5424155           504 5000 1250 40824 45 5 4 2174 10 1 111 12196 20 900 10 3 9306
30001
5427155           504 5000 1250 40824 45 5 4 2174 10 1 111 12196 20 700    3    6
30002
5424216           504 5000 1250 40824110514 7 8154 20 2 212 22196 20 900 10 3 9306
30003
5427216           504 5000 1250 40824110514 7 8134 20 2 212 22196 20 700    3    6
30004
5432155   1  2    103 6500 3250 20512 20 2 2 115  10 1 131 13323 15 300 10 3 3256
00741
5433216   1 33 20003 3000 1500 20512 55 4 7 447  10 1 142 13323 30 300 10 3 3406
00742
5434216   1 40 15003 3000 1500 20512 55 4 7 447  10 1 145 13323 30 900 10 3 9406
00743
5441152   2 30   401 4200 1050 40 11 20 2 2 117  15 2 122 22234 301100 10 111406
25681
54421511112 70  3501 4200 1050 40 21 20 2 2 117  15 2 132 22234 30 300 10 1 3406
25682
5444155     50  1001 4200 1050 40 12 60 7 5 317  15 2 132 22234 30 900 10 1 9406
26683
5447155     25  1001 4200 1050 40 21 20 2 2 117  15 2 132 22234 30 700 10 1 7406
25684

2453155   1  9    13  800  320 25524 20 2 2 1134 10 1 111 14244 15 300 75 3 3906
07501
2455155   1  2    43 2500 1000 25522 20 2 2 1134 10 1 111 14244 15 350 10 3 3756
07502
2454216   1  6  4503  800  320 25524 35 4 3 2154 60 6 614 14244 45 900 10 3 9556
07503
2457216   1  3  3503 2500 1000 25522 35 4 3 215410010 1044 14244 45 700 10 3 7556
07504
```

COMPUTER INPUT FOR ANALYSIS OF RESPONDENTS

```
FILE NAME      RGEING
VARIABLE LIST  CASE,V1 TO V36,VAS
N OF CASES     45
INPUT FORMAT   FIXED(F3.0,3F5.0,4F3.1,21F1.0,2F2.1,6F1.0,F4.3)
INPUT MEDIUM   ERGFIND1
VAR LABELS     V1 EXWVALKG ALL/V2 EXWVALKG SURFACE/V3 EXWVALKG AIR/V4 CUMPERKG/
               V5 MEAN SHIPMENTS AIR/V6 MEAN SHIPMENTS SURFACE/V7 MEAN SHIPMENTS
                 ALL/V8 EXPORT TURNOVER/V9 EXPORT SHIPMENTS/V10 SERVICES USED/
               V11 NO OF COUNTRIES AIR/V12 NO OF COUNTRIES SURFACE/V13 NO OF COU
                 NTRIES OVERALL/V14 COMBINATION OF FORWARDERS/V15 EXPORT SHIPPING
                 DECISIONS/V16 IMPORT SHIPPING DECISIONS/V17 DOMESTIC TRANSPORT OF
                 CISIONS/V18 WAREHOUSING DECISIONS/V19 STOCK MANAGEMENT DECISIONS/
                 V20 PACKING DECISIONS/V21 ORDER PROCESSING DECISIONS/V22 EXPORT I
                 NVOICING DECISIONS/V23 EXPORT SELLING DECISIONS/V24 EXPORT SALES
                 FORECASTING DECISIONS/V25 CUSTOMER ENQUIRIES DECISIONS/V26 JOB TI
                   TLE/V27 REPORTING RELATIONSHIP/V28 TIME DEVOTED TO EXPORT SHIPPIN
                   G/V29 REGULAR REPEAT ORDERS AIR/V30 REGULAR REPEAT ORDERS SURFACE
                 /V31 HIGHEST AIR RATING/V32 LOWEST AIR RATING/V33 HIGHEST SURFACE
                 RATING/V34 LOWEST SURFACE RATING/V35 AIR RATE DIFFERENCE/V36 SURF
                   ACE RATE DIFFERENCE/VAS NEW AIR OVER SURF SHIPS
VALUE LABELS   V8 (1)<#0.5M (2)#0.5-1M (3)#1-2M (4)#2-5M (5)#5-10M (6)#10-15M
               (7)#15-20M
               (8)#20-30M (9)#30M+/V9 (1)<100 (2)100-499 (3)500-999 (4)1000
               -2499 (5)2500-4999 (6)5000-9999 (7)10000+/V10 (1)AIR AND SURFACE
               (2)ONLY AIR (3)ONLY SURFACE/V14 (1)SAME ALL FOUR (2)DIFFERENT ALL
               FOUR (3)2 AIR SAME AND 2 SURF SAME (4)ONLY 2 AIR SAME (5)ONLY 2 S
               URF SAME (6)AIR USERS ALL SAME (7)SURF USERS ALL SAME (8)AIR USER
               S ALL DIFF (9)SURF USERS ALL DIFF/V15 TO V23 (1)IMPORTANT (2)CONS
               IDERED (3)NOT INVOLVED/V26 (1)SHIPPING (2)EXPORT OR SALES ADMIN
               (3)OTHER/V27 (1)DIRECTOR OR COMPANY SEC (2)OTHER/V28 (1)0% (2)UP
               TO 25% (3)26-50% (4)51-75% (5)76%+/V29 TO V30 (1)<25% (2)26-50%
               (3)51-75% (4)76%+
MISSING VALUES V1 TO V36(-9999). V4 TO V10 (0),V14 TO V34 (0), V35 TO V36 (9),VAS (-1)
```

RG FIND

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001 2500 2500 2500 2500 34500 4034097168831133333223312310100000391765
002 2000 2500 1500 40150800367971434212120211221224303074853304095
003 3100 3100 3100 45105325240431776411213121232114203000009904530
004 2500 2500 2500 50275475375331565411331111222213102583725507370
005 2000 2000 2000 10250425588761883011323333335112253088595350424
006 2200 2200 2200 30340205273331477223222231111222202095964312590
007 1000 1000 1000 01903002009711095413333111333125103075732405000
008 4375 5250 4500 0 30 3003044139841312313132311410357593261000
009 2000 2000 2000 65120333228331577411112131233313103073854305220
010 855 855 855190 75 70 737013773110131113322233025759524114300
011 0 0 0 30300225263441868311333211231125404095934611540
012 3500 3500 3500 30 15 40 20521356412112131331125101095744306670
013 3250 1500 5000 20120111511842145731131132111131230408447321000
014280002800028000 225052553855178841232322133312240400000991019
015 5000 5000 5000 0 0 0 0861005422553332333125101075e722 -1
016 900 900 900 10 10155 835414552102000020001251020978424012500
017200032000320000150580 4525083155150123331313331243025967532232000
018 2000 2000 2000 104354504430618684200000000000125 0 08591381000
019 1500 1500 0 50 0200200557077211332221332223 0400000995003000
020 2500 0 2500 0 37 0 37002303613111111131200 0 09700292668
021 0333 0333 0300 0 60 60121166912333211221225 0400009950030
022 1054 1054 0 10 0 60 60323022921232031332125 0150000990030
023999999999999999999 0430 3018056162631111111111112024040735540266700
02490000 030000 60170 01704228086112002220022242008300592668
025 4500 4500 0 75 0 63 5323117791322311111212 0300074930030
026 7500 0 7500 30143 01434515668113332213321131000000992668
027 2500 2500 2500 50 3045024022111102312333233252230305a3350125
028 6000 6000 60001201601301454413231112222213313124040737245106700
029150001500 0 40 0 63 6322115441233232121112222 0180005900030
030 6000 6000 0 75 02452454217680101001111100212 0400000990030
031 1000 1000 0 00 0 10 5032115501111221213233314 0400009690030
032 5000 5000 5000 20 70110 907219994121111333333241030959544077800
033 5000 5000 5000 0 35 70 47231455412333222111322201000000990800
03420000 020000 28658 0558122505611233221332125100000992668
035 3000 3000 3000 05 10630320222135541212213233312210200000990031
036 5000 5000 0 07 0125125431444111331111131215 0300001990030
037 1400 1400 0 14 0 73 732233044011111312222222300250005930030
038 0 0 0 0 3 0 3011260661122211233232330 09700290030
039 3500 3500 0 70 0 40 401211441233111111213 0200086920030
040 3500 3500 0 0 0 63 631230449133332112212220300074930030
041 0 0 0 0355 0355371256861100100101021340 0000973226680
042 5000 5000 5000 40 0 0 0961788411223231332125101000009900 -1
043 4167 3000 5500 20 20300267231e5e4223333331332115304076751200740
044 4200 0 4200 40459 0439342808011133233332125280 08686222668
045 1550 1550 1650 25 30 45 3844135541332221122121210255573040750
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